Agilent 1260 Infinity Variable Wavelength Detector

User Manual

Agilent Technologies

Notices

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76337 Waldbronn

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WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

In This Guide

This manual covers the Agilent 1260 Infinity Variable Wavelength Detectors

- *G1314B* Agilent 1260 Infinity Variable Wavelength Detector VL
- *G1314C* Agilent 1260 Infinity Variable Wavelength Detector VL+

1 Introduction to the Variable Wavelength Detector

This chapter gives an introduction to the detector, instrument overview and internal connectors.

2 Site Requirements and Specifications

This chapter gives information on environmental requirements, physical and performance specifications.

3 Installing the Detector

This chapter provides information on unpacking, checking on completeness, stack considerations and installation of the module.

4 Using the Detector

This chapter provides information on how to set up the detector for an analysis and explains the basic settings.

5 How to optimize the detector

This chapter gives hints on how to select the detector parameters and the flow cell.

6 Troubleshooting and Diagnostics

Overview about the troubleshooting and diagnostic features.

7 Error Information

This chapter describes the meaning of detector error messages, and provides information on probable causes and suggested actions how to recover from error conditions.

8 Test Functions

This chapter describes the detector's built in test functions.

9 Maintenance

This chapter provides general information on maintenance and repair of the detector.

10 Parts and Materials for Maintenance

This chapter provides information on parts for maintenance.

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This chapter provides information on cables used with the Agilent 1260 Infinity modules.

12 Hardware Information

This chapter describes the detector in more detail on hardware and electronics.

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This chapter gives an introduction to the detector, instrument overview and internal connectors.

Introduction to the Detector

The Agilent 1260 Infinity variable wavelength detector is designed for highest optical performance, GLP compliance and easy maintenance with:

- data rate up to , see "Peakwidth Settings" on page 66,
  - 13 Hz for standard HPLC with G1314B VWD VL,
  - 55 Hz for fast-HPLC G1314C VWD VL+,
- deuterium lamp for highest intensity and lowest detection limit over a wavelength range of 190 to 600 nm,
- optional flow-cell cartridges (standard (10 mm, 14 µL), high pressure (10 mm, 14 µL), micro (5 mm, 1 µL), semi-micro (6 mm, 5 µL)) are available and can be used depending on the application needs,
- easy front access to lamp and flow cell for fast replacement, and
- built-in holmium oxide filter for fast wavelength accuracy verification.

For specifications refer to Table 4 on page 27.

Two version of the Agilent 1260 Infinity variable wavelength detector are available:

G1314B	Agilent 1260 Infinity Variable Wavelength Detector VL
G1314C	Agilent 1260 Infinity Variable Wavelength Detector VL+ high data rates for fast HPLC

Optical System Overview

The optical system of the detector is shown in the figure below. Its radiation source is a deuterium-arc discharge lamp for the ultraviolet (UV) wavelength range from 190 to 600 nm. The light beam from the deuterium lamp passes through a lens, a filter assembly, an entrance slit, a spherical mirror (M1), a grating, a second spherical mirror (M2), a beam splitter, and finally through a flow cell to the sample diode. The beam through the flow cell is absorbed depending on the solutions in the cell, in which UV absorption takes place, and the intensity is converted to an electrical signal by means of the sample photodiode. Part of the light is directed to the reference photodiode by the beam splitter to obtain a reference signal for compensation of intensity fluctuation of the light source. A slit in front of the reference photodiode cuts out light of the sample bandwidth. Wavelength selection is made by rotating the grating, which is driven directly by a stepper motor. This configuration allows fast change of the wavelength. The cutoff filter is moved into the lightpath above 370 nm to reduce higher order light.

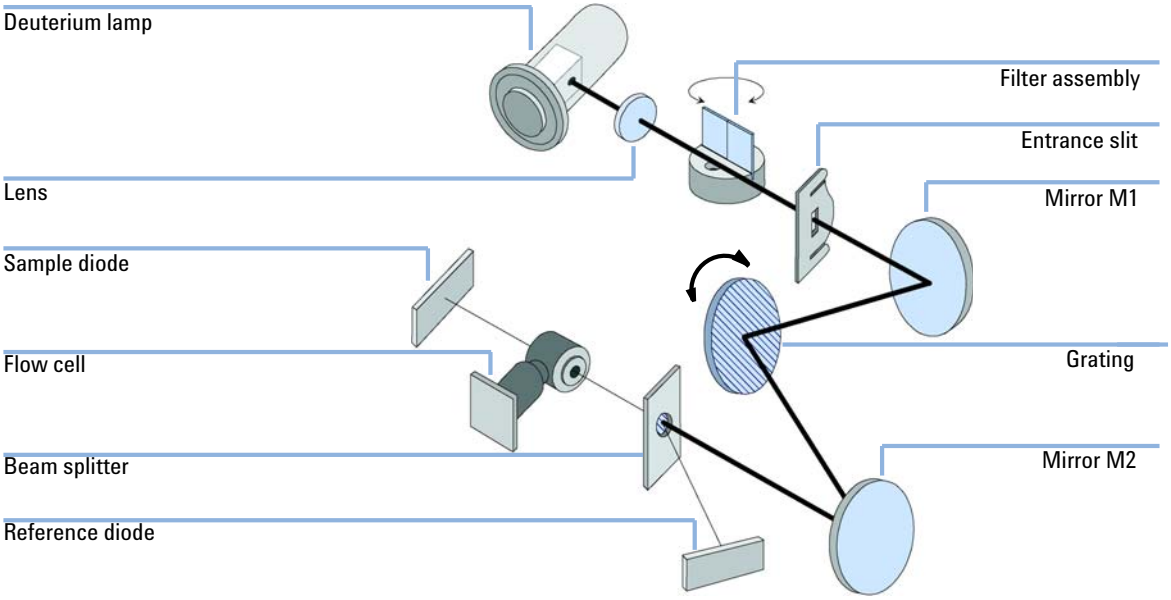

Figure 1 Optical Path of the Variable Wavelength Detector

Flow Cell

A variety of flow-cell cartridges can be inserted using the same quick and simple mounting system.

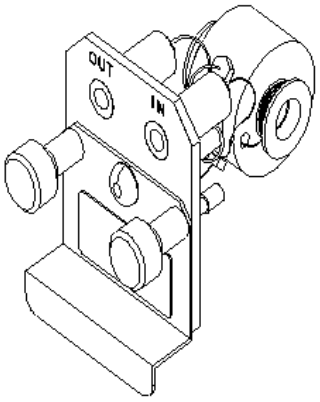

Figure 2 Cartridge Type Flow Cell

Table 1 Flow Cell Data

	STD	Semi-micro	High Pressure	Micro	
Maximum pressure	40 (4)	40 (4)	400 (40)	40 (4)	bar (MPa)
Path length	10 (conical)	6 (conical)	10 (conical)	5	mm
Volume	14	5	14	1	µL
Inlet i.d.	0.17	0.17	0.17	0.1	mm
Inlet length	750	750	750	555	mm
Outlet i.d.	0.25	0.25	0.25	0.25	mm
Outlet length	120	120	120	120	mm
Materials in contact with solvent	SST, quartz, , PEEK	SST, quartz, PTFE	SST, quartz, Kapton	SST, quartz, PTFE	

G1314B/C Lamp

The light source for the UV wavelength range is a deuterium lamp. As a result of plasma discharge in a low pressure deuterium gas, the lamp emits light over the 190 to 600 nm wavelength range.

Source Lens Assembly

The source lens receives the light from the deuterium lamp and focuses it onto the entrance slit.

Entrance Slit Assembly

The entrance slit assembly has an exchangeable slit. The standard one has a 1-mm slit. For replacement and calibration purposes to optimize the alignment, a slit with a hole is needed.

Filter Assembly

The filter assembly is electromechanically actuated. During wavelength calibrations it moves into the light path.

The filter assembly has two filters installed and is processor-controlled.

OPEN	nothing in light path
CUTOFF	cut off filter in light path at λ > 370 nm
HOLMIUM	holmium oxide filter for wavelength check

A photo sensor determines the correct position.

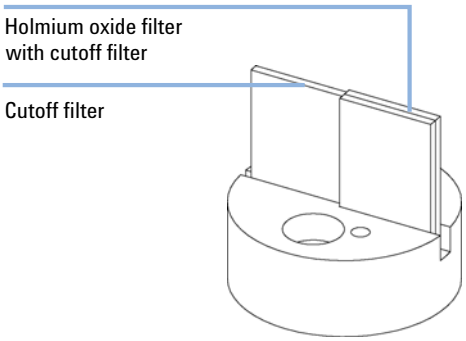

Figure 3 Filter Assembly

Mirror Assemblies M1 and M2

The instrument contains two spherical mirrors (M1 and M2). The beam adjustable is vertically and horizontally. Both mirrors are identical.

Grating Assembly

The grating separates the light beam into all its component wavelengths and reflects the light onto mirror #2.

Beam Splitter Assembly

The beam splitter splits the light beam. One part goes directly to the sample diode. The other part of the light beam goes to the reference diode.

Photo Diodes Assemblies

Two photo diode assemblies are installed in the optical unit. The sample diode assembly is located on the left side of the optical unit. The reference diode assembly is located in the front of the optical unit.

Photo Diode ADC (analog-to-digital converter)

The photo diode current is directly converted to digital data direct photo current digitalization. The data is transferred to the detector main board . The photo diode ADC boards are located close to the photo diodes.

Early Maintenance Feedback (EMF)

Maintenance requires the exchange of components which are subject to wear or stress. Ideally, the frequency at which components are exchanged should be based on the intensity of usage of the instrument and the analytical conditions, and not on a predefined time interval. The early maintenance feedback (EMF) feature monitors the usage of specific components in the instrument, and provides feedback when the user-selectable limits have been exceeded. The visual feedback in the user interface provides an indication that maintenance procedures should be scheduled.

EMF Counter

The detector module provides a EMF counter for the lamp. The counter increments with lamp use, and can be assigned a maximum limit which provides visual feedback in the user interface when the limit is exceeded. The counter can be reset to zero after the lamp is exchanged.

The detector provides the following EMF counters:

- Deuterium Lamp On-Time

Using the EMF Counters

The user-settable EMF limits for the EMF counters enable the early maintenance feedback to be adapted to specific user requirements. The useful lamp burn time is dependent on the requirements for the analysis (high or low sensitivity analysis, wavelength etc.), therefore, the definition of the maximum limits need to be determined based on the specific operating conditions of the instrument.

Setting the EMF Limits

The setting of the EMF limits must be optimized over one or two maintenance cycles. Initially, no EMF limit should be set. When instrument performance indicates maintenance is necessary, take note of the values displayed by lamp counters. Enter these values (or values slightly less than the displayed values) as EMF limits, and then reset the EMF counters to zero. The next time the EMF counters exceed the new EMF limits, the EMF flag will be displayed, providing a reminder that maintenance needs to be scheduled.

NOTE This function is only available via LMD or Instant Pilot.

Instrument Layout

The industrial design of the module incorporates several innovative features. It uses Agilent's E-PAC concept for the packaging of electronics and mechanical assemblies. This concept is based upon the use of expanded polypropylene (EPP) layers of foam plastic spacers in which the mechanical and electronic boards components of the module are placed. This pack is then housed in a metal inner cabinet which is enclosed by a plastic external cabinet. The advantages of this packaging technology are:

- virtual elimination of fixing screws, bolts or ties, reducing the number of components and increasing the speed of assembly/disassembly,
- the plastic layers have air channels molded into them so that cooling air can be guided exactly to the required locations,
- the plastic layers help cushion the electronic and mechanical parts from physical shock, and
- the metal inner cabinet shields the internal electronics from electromagnetic interference and also helps to reduce or eliminate radio frequency emissions from the instrument itself.

2
Site Requirements and Specifications

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Performance Specifications 25
Specification Conditions 29

This chapter gives information on environmental requirements, physical and performance specifications.

Site Requirements

Site Requirements

A suitable environment is important to ensure optimal performance of the instrument.

Power Consideration

The detector power supply has wide ranging capabilities, see "Physical Specifications" on page 24. It accepts any line voltage in the above mentioned range. Consequently, there is no voltage selector in the rear of the detector. There are also no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

WARNING

Instrument is partially energized when switched off

The power supply still uses some power, even when the power switch on the front panel is turned OFF. Repair work at the detector can lead to personal injuries, e. g. shock hazard, when the detector cover is opened and the instrument is connected to power.

➔ To disconnect the detector from the power line, unplug the power cord.

WARNING

Hazard of electrical shock or damage of your instrumentation

can result, if the devices are connected to a line voltage higher than specified.

➔ Connect your instrument to the specified line voltage only.

CAUTION

Inaccessible power plug.

In case of emergency it must be possible to disconnect the instrument from the power line at any time.

➔ Make sure the power connector of the instrument can be easily reached and unplugged.

➔ Provide sufficient space behind the power socket of the instrument to unplug the cable.

Power Cords

Different power cords are offered as options with the module. The female end of all power cords is identical. It plugs into the power-input socket at the rear. The male end of each power cord is different and designed to match the wall socket of a particular country or region.

WARNING

Absence of ground connection or use of unspecified power cord

The absence of ground connection or the use of unspecified power cord can lead to electric shock or short circuit.

➔ Never operate your instrumentation from a power outlet that has no ground connection.

➔ Never use a power cord other than the Agilent Technologies power cord designed for your region.

WARNING

Use of unsupplied cables

Using cables not supplied by Agilent Technologies can lead to damage of the electronic components or personal injury.

➔ Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

WARNING

Unintended use of supplied power cords

Using power cords for unintended purposes can lead to personal injury or damage of electronic equipment.

➔ Never use the power cords that Agilent Technologies supplies with this instrument for any other equipment.

Bench Space

The detector dimensions and weight (see "Physical Specifications" on page 24) allows you to place the detector on almost any desk or laboratory bench. It needs an additional 2.5 cm (1.0 inch) of space on either side and approximately 8 cm (3.1 inch) in the rear for air circulation and electric connections.

If the bench should carry an Agilent 1200 Infinity Series system, make sure that the bench is designed to bear the weight of all modules.

The detector should be operated in a horizontal position.

Environment

Your detector will work within the specifications at ambient temperatures and relative humidity described in "Physical Specifications" on page 24.

ASTM drift tests require a temperature change below 2 °C/h (3.6 °F/h) over one hour period. Our published drift specification (refer also to "Performance Specifications G1314B" on page 25 or "Performance Specifications G1314C" on page 27) is based on these conditions. Larger ambient temperature changes will result in larger drift.

Better drift performance depends on better control of the temperature fluctuations. To realize the highest performance, minimize the frequency and the amplitude of the temperature changes to below 1 °C/h (1.8 °F/h). Turbulences around one minute or less can be ignored.

CAUTION

Condensation within the module

Condensation will damage the system electronics.

➔ Do not store, ship or use your module under conditions where temperature fluctuations could cause condensation within the module.

➔ If your module was shipped in cold weather, leave it in its box and allow it to warm slowly to room temperature to avoid condensation.

NOTE

This module is designed to operate in a typical electromagnetic environment, i.e. where RF transmitters such as mobile telephones may not be used in close proximity.

Physical Specifications

Table 2 Physical Specifications

Type	Specification	Comments
Weight	11 kg (25 lbs)	
Dimensions (height × width × depth)	140 x 345 x 435 mm (5.5 x 13.5 x 17 inches)	
Line voltage	100 – 240 VAC, ± 10 %	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5 %	
Power consumption	220 VA, 85 W / 290 BTU	Maximum
Ambient operating temperature	0–55 °C (32–131 °F)	
Ambient non-operating temperature	-40 – 70 °C (-4 – 158 °F)	
Humidity	< 95 %, at 25 – 40 °C (77 – 104 °F)	Non-condensing
Operating altitude	Up to 2000 m (6562 ft)	
Non-operating altitude	Up to 4600 m (15091 ft)	For storing the module
Safety standards: IEC, CSA, UL	Installation category II, Pollution degree 2	For indoor use only.

Performance Specifications

Performance Specifications G1314B

Table 3 Performance Specifications G1314B

Type	Specification	Comments
Detection type	Double-beam photometer	
Light source	Deuterium lamp	
Wavelength range	190 – 600 nm	
Short term noise (ASTM)	<± $0.5 \cdot 10^{-5}$ AU at 254 nm	See "Specification Conditions" on page 29
Drift	$3 \cdot 10^{-4}$ AU/h at 254 nm	See "Specification Conditions" on page 29.
Linearity	> 2 AU (5 %) upper limit	See "Specification Conditions" on page 29.
Wavelength accuracy	± 1 nm	Self-calibration with deuterium lines, verification with holmium oxide filter
Maximum data rate	13 Hz	
Band width	6.5 nm typical	
Flow cells	Standard: 14 µL volume, 10 mm cell path length and 40 bar (580 psi) pressure maximum High pressure: 14 µL volume, 10 mm cell path length and 400 bar (5800 psi) pressure maximum Micro: 1 µL volume, 5 mm cell path length and 40 bar (580 psi) pressure maximum Semi-micro: 5 µL volume, 6 mm cell path length and 40 bar (580 psi) pressure maximum	Can be repaired on component level

Table 3 Performance Specifications G1314B

Type	Specification	Comments
Control and data evaluation	Agilent ChemStation for LC	
Analog outputs	Recorder/integrator: 100 mV or 1 V, output range 0.001 to 2 AU, one output	
Communications	Controller-area network (CAN), RS-232C, APG Remote: ready, start, stop and shut-down signals, LAN (optional)	
Safety and maintenance	Extensive diagnostics, error detection and display (through Agilent ChemStation), leak detection, safe leak handling, leak output signal for shutdown of pumping system. Low voltages in major maintenance areas.	
GLP features	Early maintenance feedback (EMF) for continuous tracking of instrument usage in terms of lamp burn time with user-settable limits and feedback messages. Electronic records of maintenance and errors. Verification of wavelength accuracy with built-in holmium oxide filter.	
Housing	All materials recyclable.	

Performance Specifications G1314C

Table 4 Performance Specifications G1314C

Type	Specification	Comments
Detection type	Double-beam photometer	
Light source	Deuterium lamp	
Wavelength range	190 – 600 nm	
Short term noise (ASTM)	$<\pm 0.5 \cdot 10^{-5}$ AU at 254 nm	See "Specification Conditions" on page 29
Drift	$3 \cdot 10^{-4}$ AU/h at 254 nm	See "Specification Conditions" on page 29.
Linearity	> 2 AU (5 %) upper limit	See "Specification Conditions" on page 29.
Wavelength accuracy	± 1 nm	Self-calibration with deuterium lines, verification with holmium oxide filter
Maximum data rate	55 Hz	
Band width	6.5 nm typical	
Flow cells	Standard: 14 µL volume, 10 mm cell path length and 40 bar (580 psi) pressure maximum High pressure: 14 µL volume, 10 mm cell path length and 400 bar (5800 psi) pressure maximum Micro: 1 µL volume, 5 mm cell path length and 40 bar (580 psi) pressure maximum Semi-micro: 5 µL volume, 6 mm cell path length and 40 bar (580 psi) pressure maximum	Can be repaired on component level
Control and data evaluation	Agilent ChemStation for LC	

Table 4 Performance Specifications G1314C

Type	Specification	Comments
Analog outputs	Recorder/integrator: 100 mV or 1 V, output range 0.001 to 2 AU, one output	
Communications	Controller-area network (CAN), RS-232C, APG Remote: ready, start, stop and shut-down signals, LAN (optional)	
Safety and maintenance	Extensive diagnostics, error detection and display (through Agilent ChemStation), leak detection, safe leak handling, leak output signal for shutdown of pumping system. Low voltages in major maintenance areas.	
GLP features	Early maintenance feedback (EMF) for continuous tracking of instrument usage in terms of lamp burn time with user-settable limits and feedback messages. Electronic records of maintenance and errors. Verification of wavelength accuracy with built-in holmium oxide filter.	
Housing	All materials recyclable.	

Specification Conditions

ASTM: “Standard Practice for Variable Wavelength Photometric Detectors Used in Liquid Chromatography”.

Reference conditions: Standard flow cell, path length 10 nm, flow 1 mL/min LC-grade methanol.

Noise:

<± $0.5 \cdot 10^{-5}$ AU at 254 nm, TC 2 s, ASTM

RT = 2.2 * TC

Linearity:

Linearity is measured with caffeine at 265 nm.

NOTE The specifications are based on the standard lamp (G1314-60100) and may be not achieved when other lamp types or aged lamps are used.

ASTM drift tests require a temperature change below 2 °C/hour (3.6 F/hour) over one hour period. Our published drift specification is based on these conditions. Larger ambient temperature changes will result in larger drift.

Better drift performance depends on better control of the temperature fluctuations. To realize the highest performance, minimize the frequency and the amplitude of the temperature changes to below 1 °C/hour (1.8 F/hour). Turbulences around one minute or less can be ignored.

Performance tests should be done with a completely warmed up optical unit (> two hours). ASTM measurements require that the detector should be turned on at least 24 hours before start of testing.

Time Constant versus Response Time

According to ASTM E1657-98 „Standard Practice of Testing Variable-Wavelength Photometric Detectors Used in Liquid Chromatography” the time constant is converted to response time by multiplying by the factor 2.2.

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Installing the Detector

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This chapter provides information on unpacking, checking on completeness, stack considerations and installation of the module.

Unpacking the Detector

Damaged Packaging

If the delivery packaging shows signs of external damage, please call your Agilent Technologies sales and service office immediately. Inform your service representative that the instrument may have been damaged during shipment.

CAUTION

"Defective on arrival" problems

If there are signs of damage, please do not attempt to install the module. Inspection by Agilent is required to evaluate if the instrument is in good condition or damaged.

➔ Notify your Agilent sales and service office about the damage.

➔ An Agilent service representative will inspect the instrument at your site and initiate appropriate actions.

Condensation

CAUTION

Condensation within the detector

Condensation will damage the system electronics.

➔ Do not store, ship or use your detector under conditions where temperature fluctuations could cause condensation within the detector.

➔ If your detector was shipped in cold weather, leave it in its box and allow it to warm up slowly to room temperature to avoid condensation.

Delivery Checklist

Ensure all parts and materials have been delivered with the detector. The delivery checklist is shown below. Please report missing or damaged parts to your local Agilent Technologies sales and service office.

Table 5 Variable Wavelength Detector Checklist

Description	Quantity
Variable wavelength detector	1
Power cable	1
Flow cell	As ordered
User Documentation DVD	1
Accessory kit (see "Accessory Kit" on page 144)	1

Detector Accessory Kit Contents

The G1314B/C VWD is shipped with Accessory kit (p/n G1314-68755) (see "Accessory Kit" on page 144).

Optimizing the Stack Configuration

If your module is part of a complete Agilent Liquid Chromatograph, you can ensure optimum performance by installing the following configurations. These configurations optimize the system flow path, ensuring minimum delay volume.

One Stack Configuration

Ensure optimum performance by installing the modules of the Agilent 1260 Infinity LC System in the following configuration (See Figure 4 on page 35 and Figure 5 on page 36). This configuration optimizes the flow path for minimum delay volume and minimizes the bench space required.

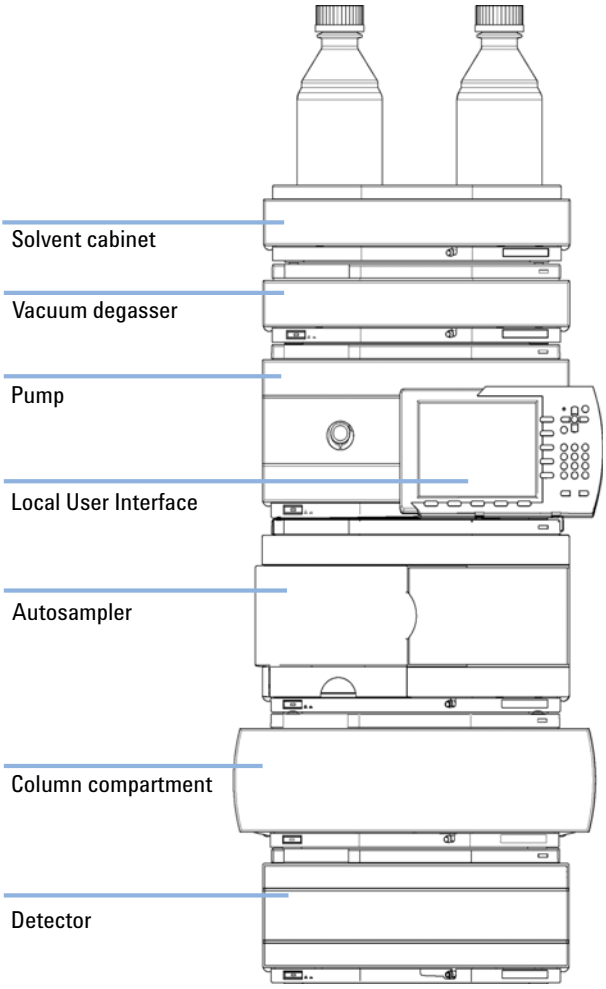


Figure 4 Recommended Stack Configuration for 1260 (Front View)

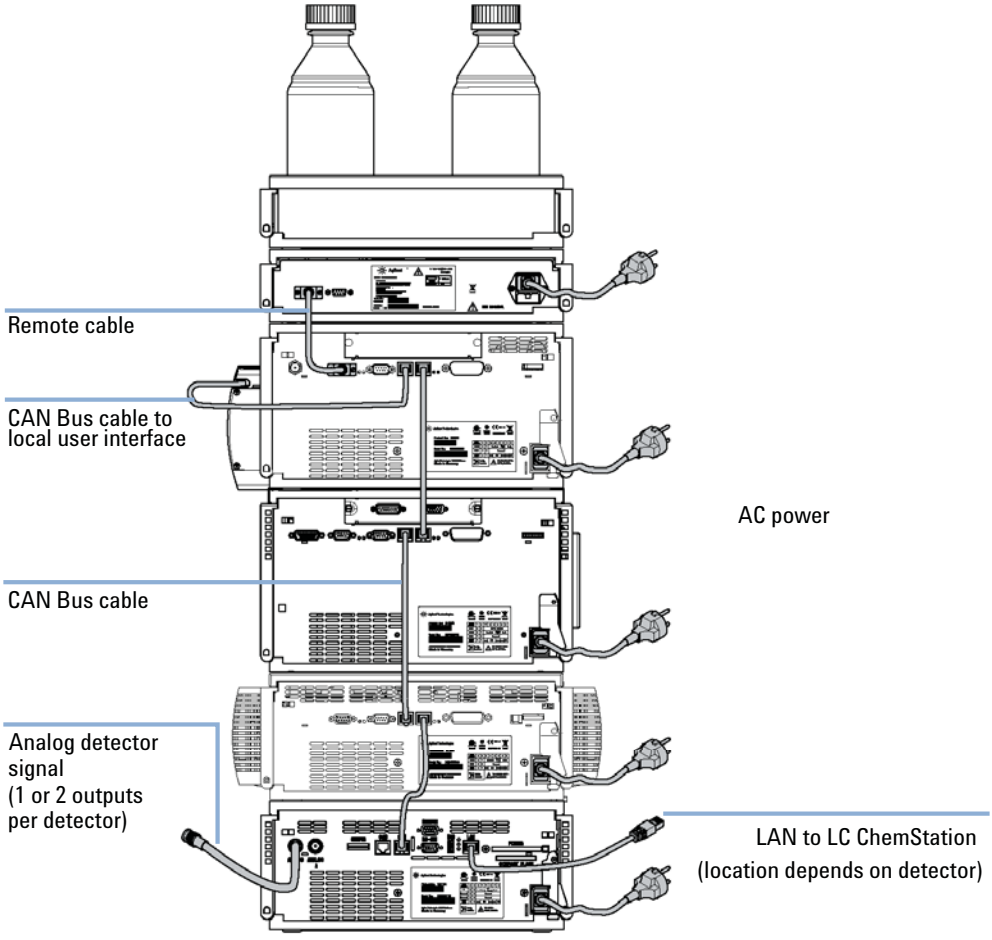

Remote cable
CAN Bus cable to local user interface
CAN Bus cable
Analog detector signal (1 or 2 outputs per detector)
AC power
LAN to LC ChemStation (location depends on detector)

Figure 5 Recommended Stack Configuration for 1260 (Rear View)

Two Stack Configuration

To avoid excessive height of the stack when the autosampler thermostat is added to the system it is recommended to form two stacks. Some users prefer the lower height of this arrangement even without the autosampler thermostat. A slightly longer capillary is required between the pump and autosampler. (See Figure 6 on page 37 and Figure 7 on page 38).

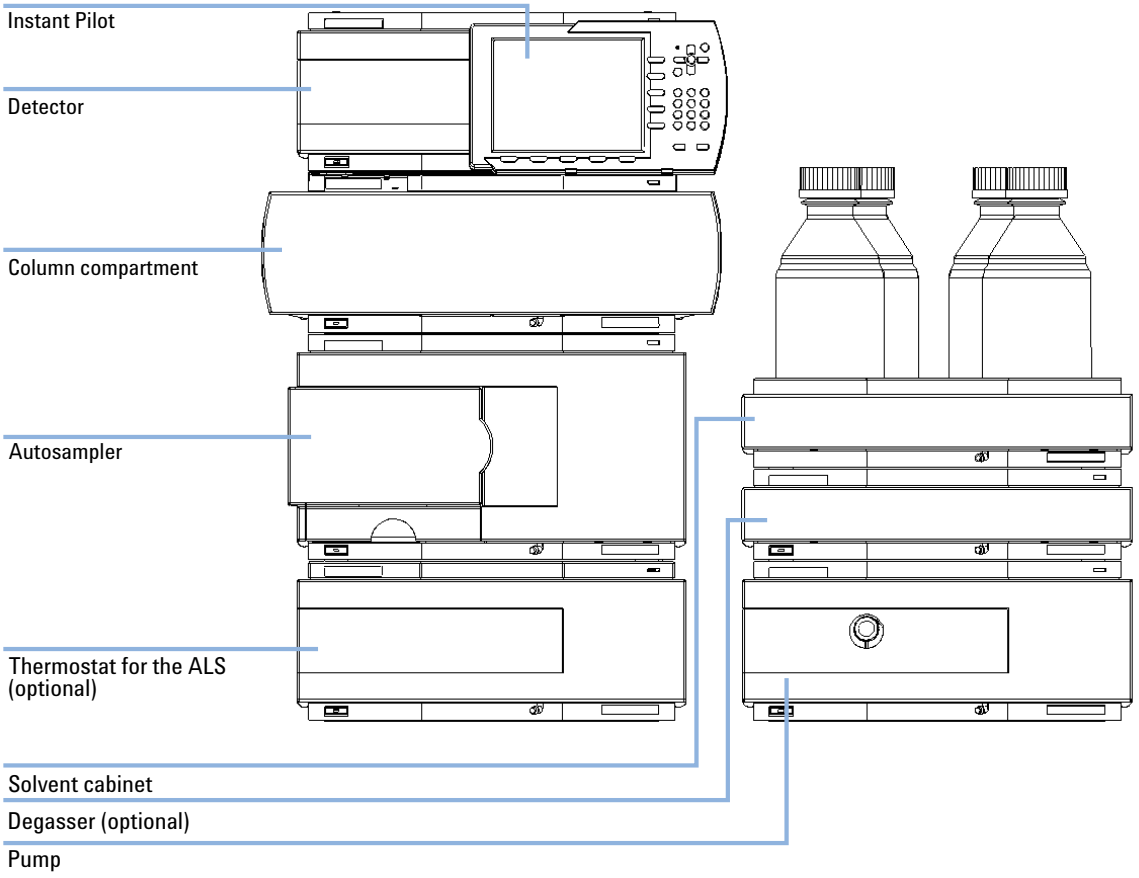


Figure 6 Recommended Two Stack Configuration for 1260 (Front View)

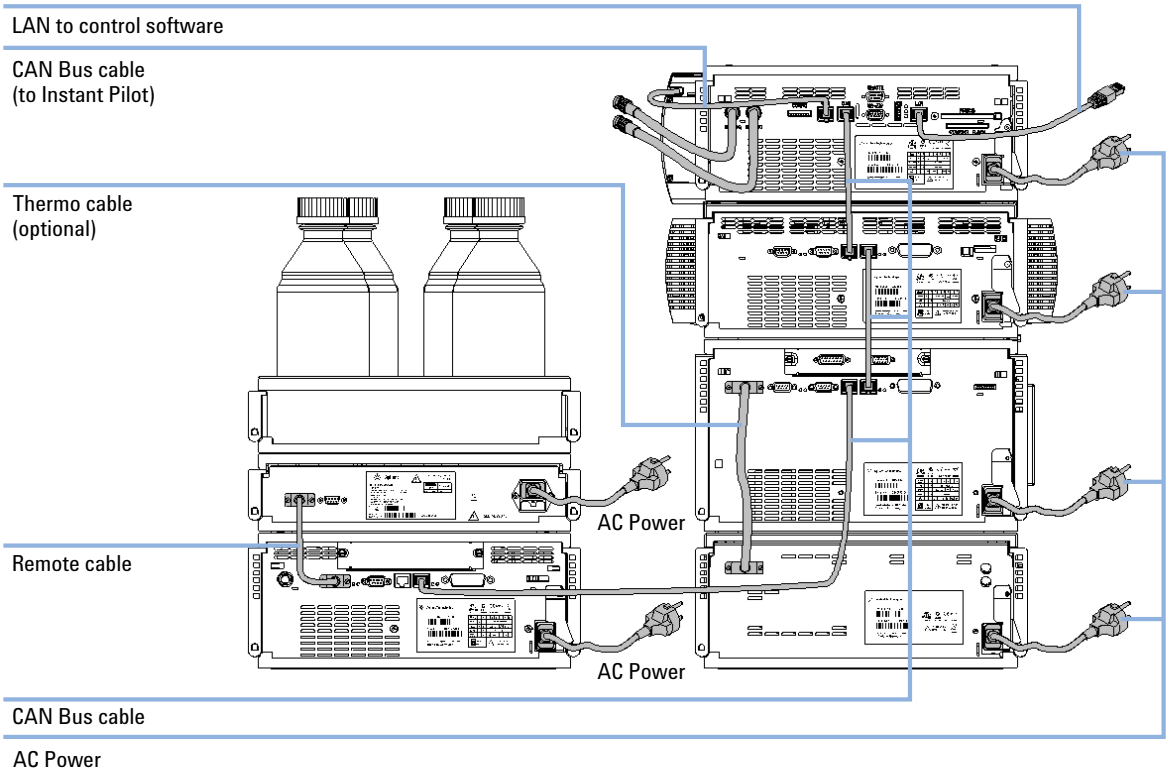


Figure 7 Recommended Two Stack Configuration for 1260 (Rear View)

Installing the Detector

Parts required

#	p/n	Description
1		Detector
1		Power cord
1		LAN cable (cross-over or twisted pair network cable)
1		Agilent ChemStation or other control software
1	G4208A	Instant Pilot

For other cables see below and section "Cable Overview" on page 146.

Instant Pilot (G4208A) is optional.

Preparations

Other LC modules must have appropriate firmware installed to work with the detector.

- Locate bench space.
- Provide power connections.
- Unpack the detector.

NOTE

Before adding the detector into an existing system assure that the existing modules have been updated to firmware revision that is supported by the control software.

1. Install the LAN interface board in the detector (if required), see "Replacing the Interface Board" on page 130
2. Place the detector in the stack or on the bench in a horizontal position.

3 Ensure the line power switch at the front of the detector is OFF.

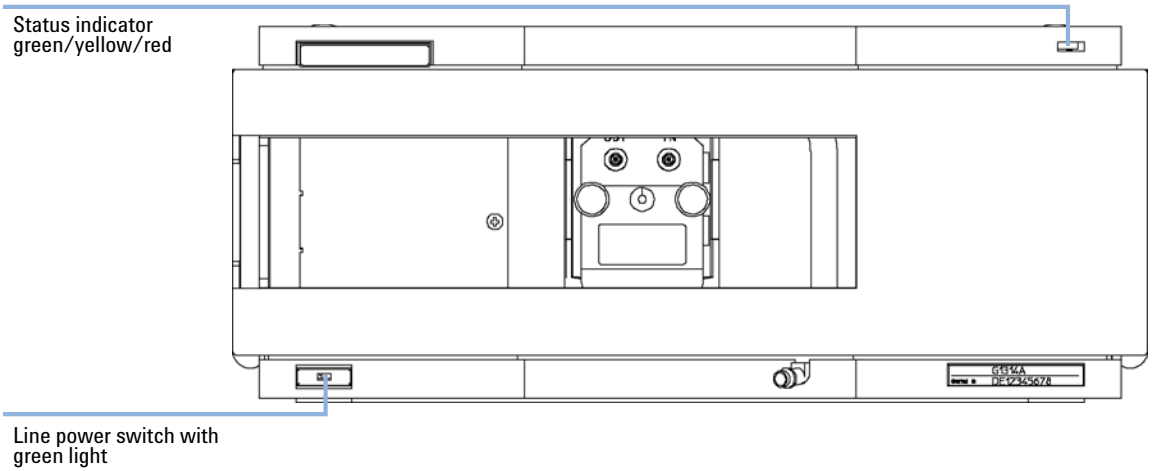


Figure 8 Front View of Detector

NOTE The figure above shows the flow cell already installed. The flow cell area is closed with a cover. The flow cell has to be installed as described in "Flow Connections to the Detector" on page 42.

4 Connect the power cable to the power connector at the rear of the detector.

5 Connect the CAN cable to other Agilent 1260 Infinity modules.

6 If a Agilent ChemStation is the controller, connect the LAN connection to the LAN interface board in the detector.

NOTE If an Agilent 1200 Infinity Series DAD/MWD/FLD is in the system, the LAN should be connected to the DAD/MWD/FLD (due to higher data load).

7 Connect the analog cable (optional).

8 Connect the APG remote cable (optional) for non-Agilent 1260 Infinity instruments.

9 Turn ON power by pushing the button at the lower left-hand side of the detector. The status LED should be green.

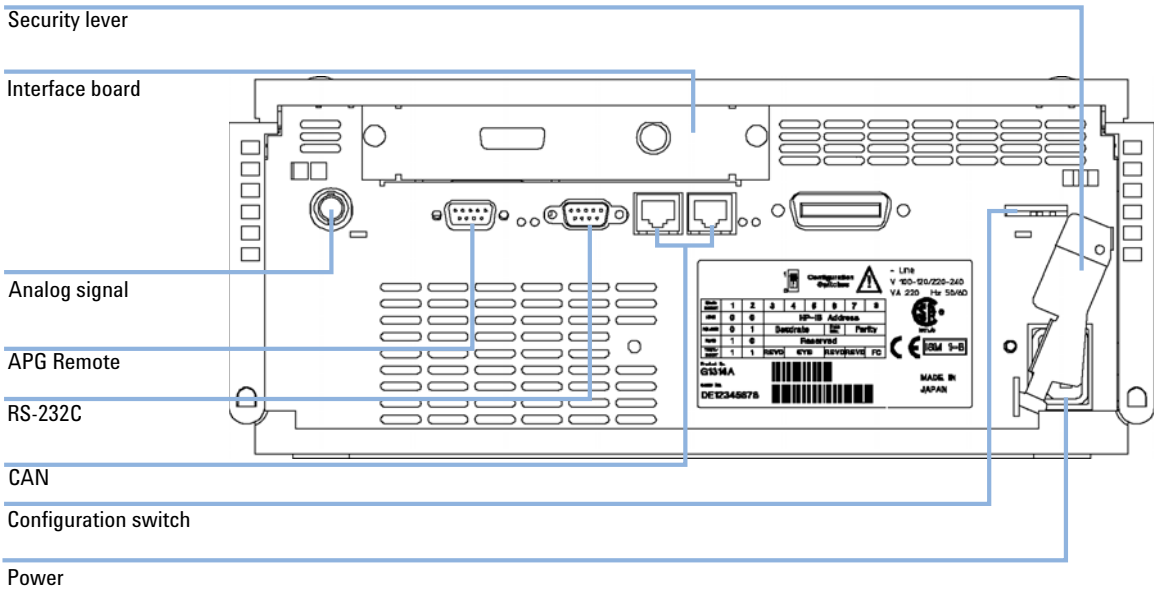


Figure 9 Rear View of Detector

NOTE The detector is turned ON when the line power switch is pressed and the green indicator lamp is illuminated. The detector is turned OFF when the line power switch is protruding and the green light is OFF.

NOTE To disconnect the detector from line, unplug the power cord. The power supply still uses some power, even if the power switch at the front panel is turned OFF.

NOTE The detector was shipped with default configuration settings. To change these settings, see "Setting the 8-bit Configuration Switch (without On-board) LAN" on page 175.

Flow Connections to the Detector

Tools required	**Description** Wrench, 1/4 – 5/16 inch
Parts required	**# p/n Description** 1 G1314-68755 Accessory kit
Hardware required	Other modules depend on system setup
Preparations	Detector is installed in the LC system.

WARNING

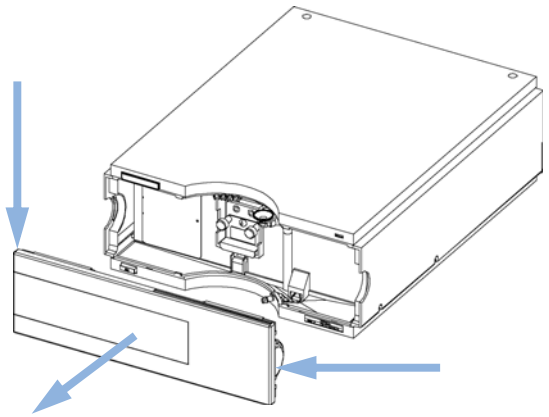
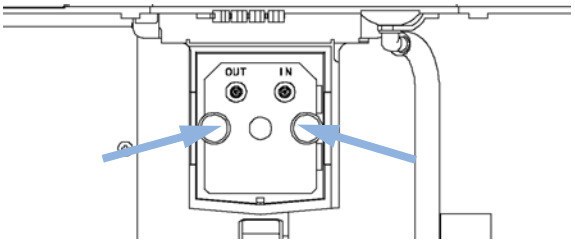
Toxic, flammable and hazardous solvents, samples and reagents

The handling of solvents, samples and reagents can hold health and safety risks.

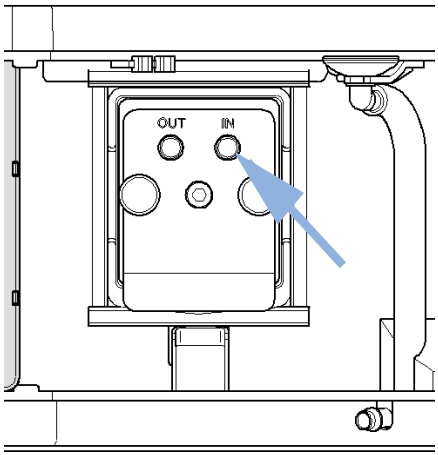
- ➔ When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.
- ➔ The volume of substances should be reduced to the minimum required for the analysis.
- ➔ Do not operate the instrument in an explosive atmosphere.

NOTE

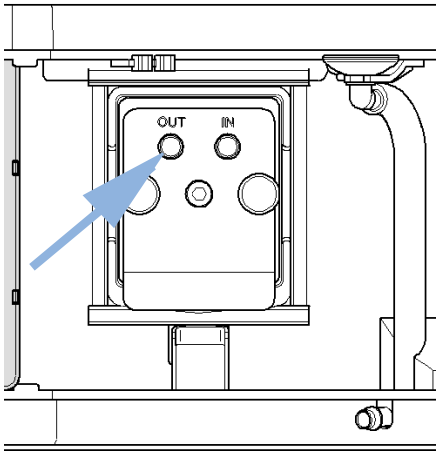
The flow cell is shipped with a filling of isopropanol (also recommended when the instrument and/or flow cell is shipped to another location). This is to avoid breakage due to subambient conditions.

1 Press the release buttons and remove the front cover to have access to the lamp area. 	**2** Remove the plastic dummy cover. OR If the detector uses a metal plate, loose the screws of the flow cell dummy plate by turning each screw one turn. Then unscrew the screws completely. This is required to avoid any problem with helicoil insert in the casting.
3 Press the flow cell completely into the slot and tighten the cell screws (both parallel) until the mechanical stop. 	**4** Assemble the column-detector capillary. Depending on the flow cell type it may be a PEEK or SST capillary.

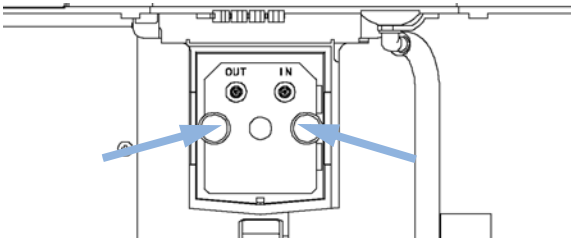
5 Connect the newly assembled fitting of the capillary to the inlet connector and connect the other end of the capillary to the column.



6 Connect the PEEK waste capillary to the outlet connector.



7 Establish a flow and observe for leakage.



8 Replace the front cover.

The installation of the detector is now complete.

NOTE The detector should be operated with the front cover in place to protect the flow cell area against strong drafts from the outside.

4 Using the Detector

Setting up an Analysis 46
- Before Using the System 46
- Requirements and Conditions 48
- Optimization of the System 50
- Preparing the HPLC System 51
- Running the Sample and Verifying the Results 60

Special Settings of the Detector 61
- Control Settings 61
- Online Spectra 62
- Scanning with the VWD 63
- Analog Output Settings 64
- Special Setpoints 65

This chapter provides information on how to set up the detector for an analysis and explains the basic settings.

Setting up an Analysis

This chapter can be used for

- preparing the system,
- to learn the set up of an HPLC analysis and
- to use it as an instrument check to demonstrate that all modules of the system are correctly installed and connected. It is not a test of the instrument performance.
- Learn about special settings

NOTE All descriptions are based on the Agilent ChemStation B.02.01. Newer versions may look different.

Before Using the System

Solvent Information

Observe recommendations on the use of solvents in chapter “Solvents” in the pump’s reference manual.

Priming and Purging the System

When the solvents have been exchanged or the pumping system has been turned off for a certain time (for example, overnight) oxygen will re-diffuse into the solvent channel between the solvent reservoir, vacuum degasser (when available in the system) and the pump. Solvents containing volatile ingredients will slightly lose these. Therefore priming of the pumping system is required before starting an application.

Table 6 Choice of Priming Solvents for Different Purposes

Activity	Solvent	Comments
After an installation	Isopropanol	Best solvent to flush air out of the system
When switching between reverse phase and normal phase (both times)	Isopropanol	Best solvent to flush air out of the system
After an installation	Ethanol or Methanol	Alternative to Isopropanol (second choice) if no Isopropanol is available
To clean the system when using buffers	Bidistilled water	Best solvent to re-dissolve buffer crystals
After a solvent change	Bidistilled water	Best solvent to re-dissolve buffer crystals
After the installation of normal phase seals (P/N 0905-1420)	Hexane + 5% Isopropanol	Good wetting properties

NOTE The pump should never be used for priming empty tubings (never let the pump run dry). Use a syringe to draw enough solvent for completely filling the tubings to the pump inlet before continuing to prime with the pump.

1 Open the purge valve of your pump (by turning it counterclockwise) and set flow rate to 3 – 5 mL/min.
2 Flush all tubes with at least 30 mL of solvent.
3 Set flow to required value of your application and close the purge valve.

NOTE Pump for approximately 10 minutes before starting your application.

Requirements and Conditions

What You Will Need

The table below lists the items you need to have for the set up of the analysis. Some of these are optional (not required for the basic system).

Table 7 What you will need

Agilent 1200 Infinity Series system	Pump (plus degassing)
	Autosampler
	Detector, standard flow cell installed
	Degasser (optional)
	Column Compartment (optional)
	Agilent ChemStation or Instant Pilot G4208, optional for basic operation.
	System should be correctly set up for LAN communication with the Agilent ChemStation
Column:	Zorbax Eclipse XDB-C18, 4.6 x 150 mm, 5 µm (p/n 993967-902) or an equivalent column
Standard:	Agilent isocratic checkout sample (p/n 01080-68704)

Conditions

A single injection of the isocratic test standard is made under the conditions given in Table 8 on page 49:

Table 8 Conditions

Flow	1.5 mL/min
Stoptime	8 min
Solvent	100% (30% water/70% Acetonitrile)
Temperature	Ambient
Wavelength	sample 254 nm
Injection Volume	1 µL
Column Temperature (optional):	25 °C or ambient

Typical Chromatogram

A typical chromatogram for this analysis is shown in Figure 10 on page 50. The exact profile of the chromatogram will depend on the chromatographic conditions. Variations in solvent quality, column packing, standard concentration and column temperature will all have a potential effect on peak retention and response.

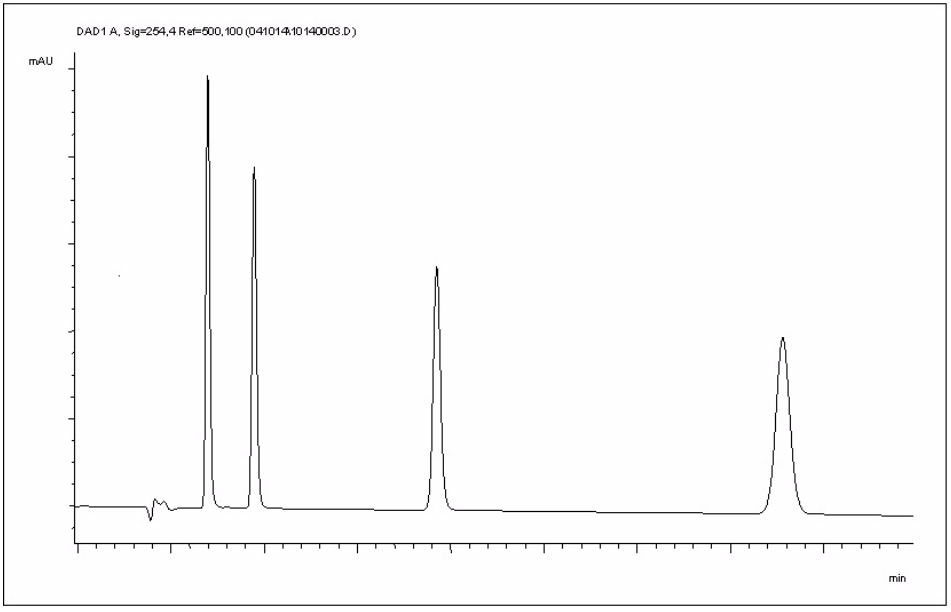


Figure 10 Typical Chromatogram with UV-detector

Optimization of the System

The settings used for this analysis are specific for this purpose. For other applications the system can be optimized in various ways. Please refer to the section "Optimizing the Detector Performance" on page 70.

Preparing the HPLC System

1 Turn on the Agilent ChemStation PC and the monitor.

2 Turn on the modules.

3 Start the Agilent ChemStation software. If the pump, autosampler, thermostatted column compartment and detector are found, the Agilent ChemStation screen should look like shown in Figure 11 on page 51. The System status is red (**Not Ready**).

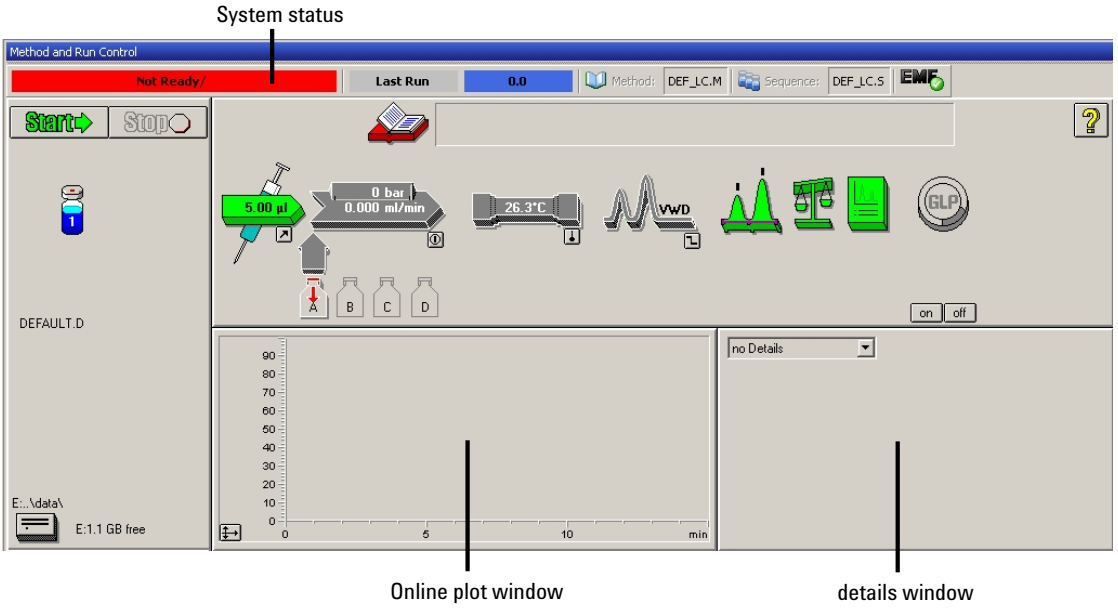


Figure 11 Initial Agilent ChemStation screen (**Method and Run Control**)

4 Turn on the detector lamp, pump and autosampler by clicking the **System On** button or the buttons below the module icons on the graphical user interface (GUI).

After some time, the pump, thermostatted column compartment and detector module will turn to green.

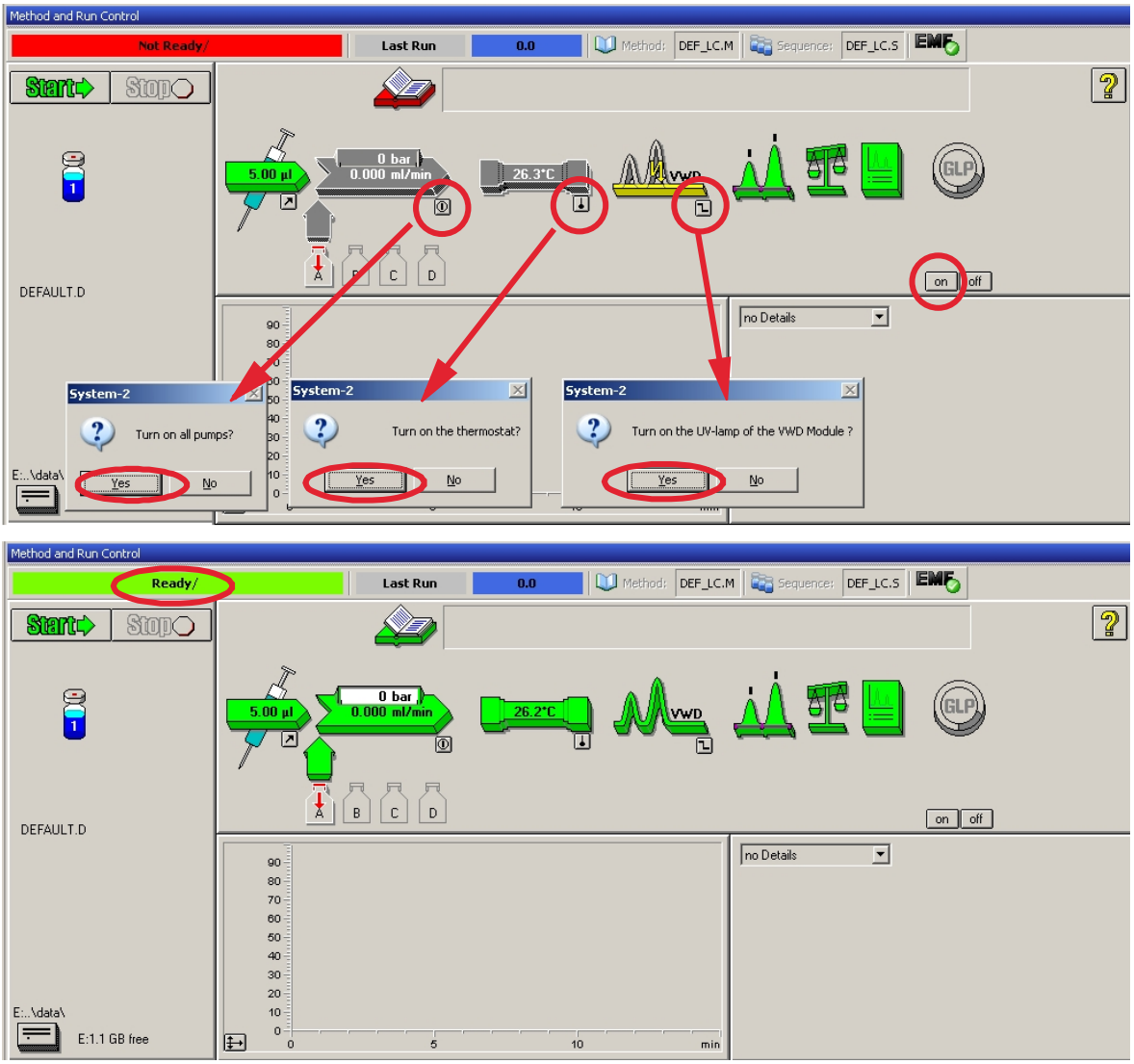


Figure 12 Turning on the HPLC Module

5 Purge the pump. For more information “Priming and Purging the System” on page 46.

6 Allow the detector to warm up of at least 60 minutes to provide a stable baseline (see example in Figure 13 on page 53).

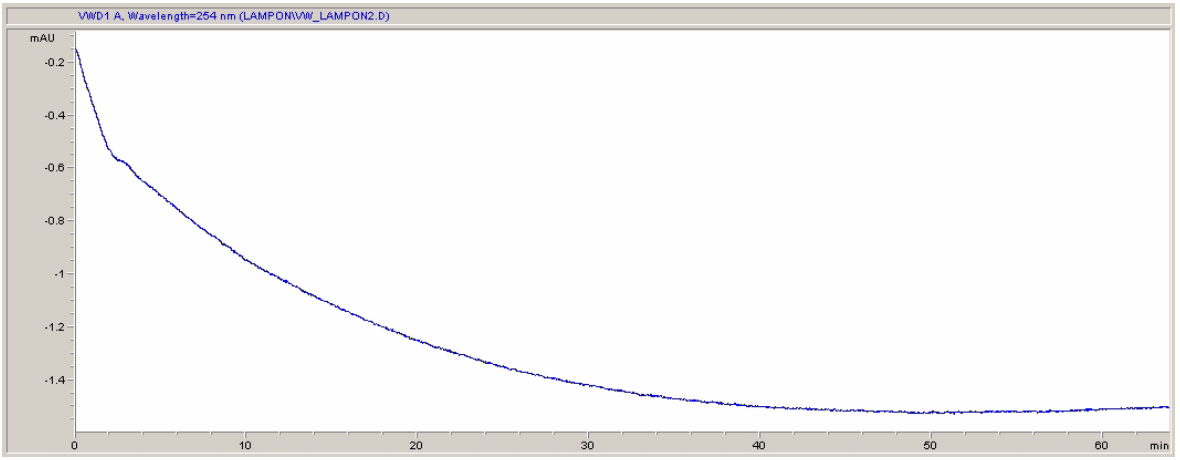


Figure 13 Stabilization of Baseline

NOTE For reproducible chromatography, the detector and lamp should be on for at least one hour. Otherwise the detector baseline may still drift (depending on the environment).

7 For the isocratic pump, fill the solvent bottle with the mixture of HPLC-grade bi-distilled water (30 %) and acetonitrile (70 %). For binary- and quaternary pumps you can use separate bottles.

8 Click on the **Load Method** button and select **DEF_LC.M** and press **OK**. Alternative double-click on the method in the method window. The default LC method parameters are transferred into the Agilent 1200 Infinity Series modules.

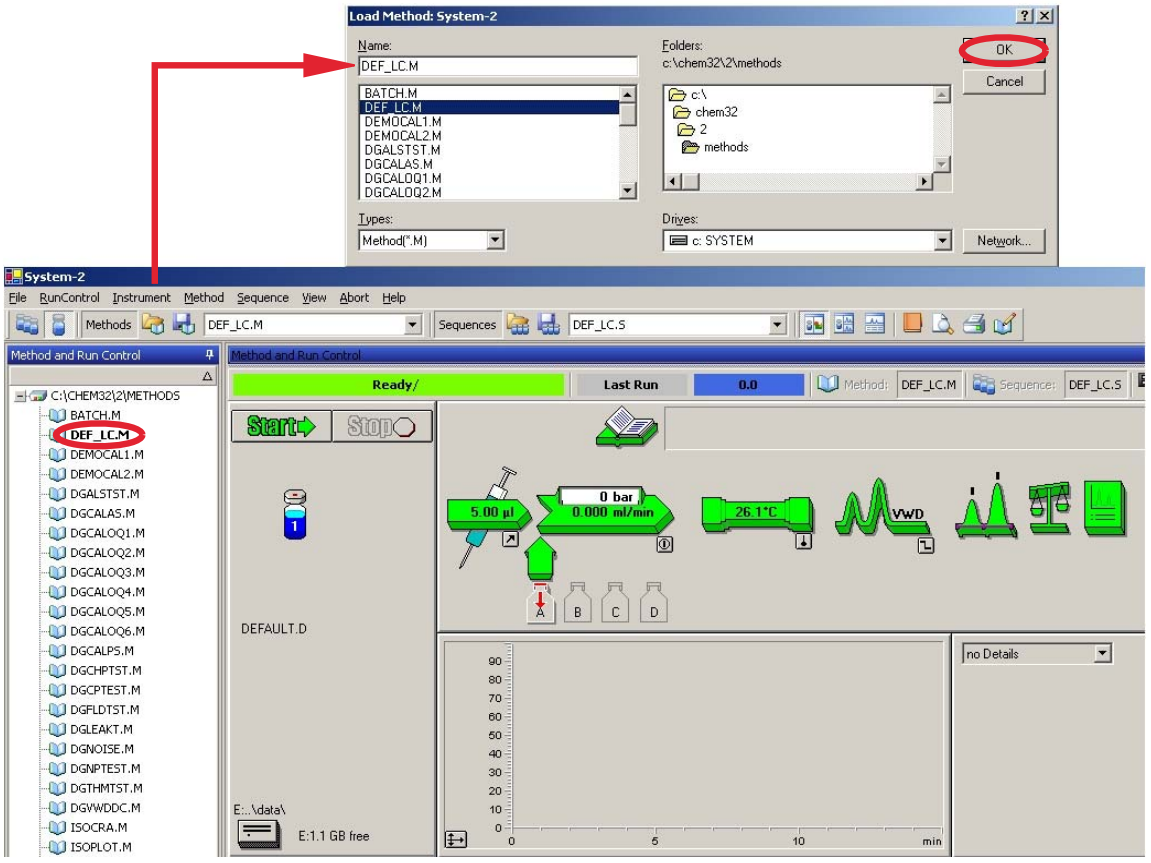


Figure 14 Loading Default LC Method

9 Click on the module icons (Figure 15 on page 55) and open the **Setup** of these modules. Figure 16 on page 56 shows the detector settings (do not change the detector parameters at this time).

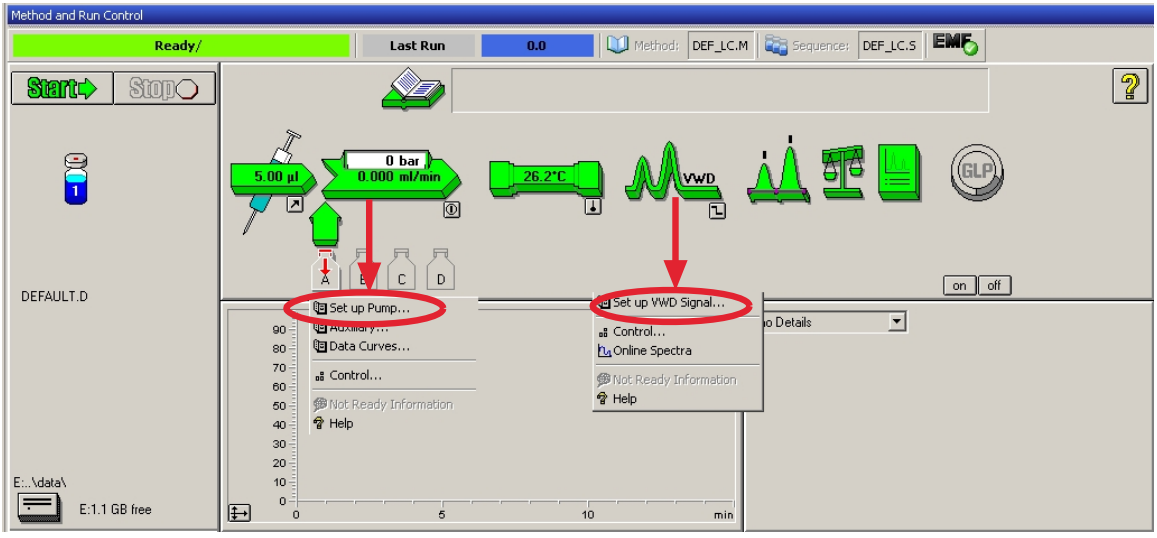
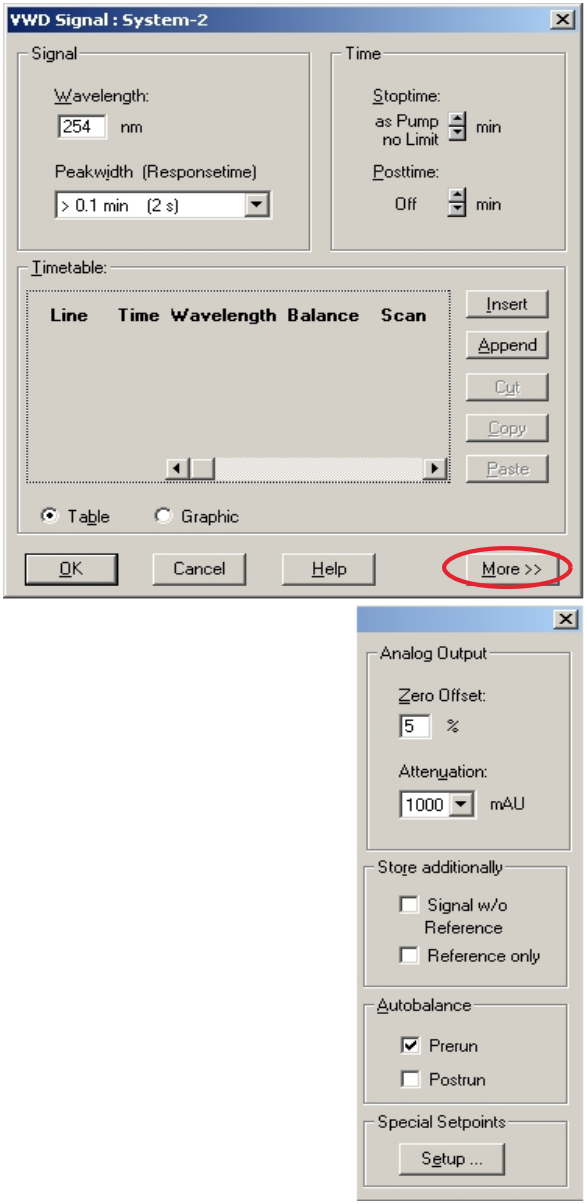


Figure 15 Open the module menu

10 Enter the pump parameters mentioned under Table 8 on page 49



- 1 signal with individual wavelength setting
- stop and post time can be set (if required)
- peakwidth depends on the peaks in the chromatogram, see "Peakwidth Settings" on page 66.

- time table for programmable actions during the run

- Zero Offset Limits: 1 – 99 % in steps of 1 %

- Attenuation Limits: 0.98 – 4000 mAU at discrete values for either 100 mV or 1 V full scale

- additional signals can be stored with the normal signal (for diagnostics)

- autobalance to zero absorbance (on the analog output plus offset) at begin and/or end of run

- see "Special Setpoints" on page 65.

Figure 16 Detector Settings (default)

11 Pump the water/acetonitrile (30/70 %) mobile phase through the column for 10 minutes for equilibration.

12 Click the button and select **Change...** to open the Signal Plot information. Select the **Pump: Pressure** and the **VWD A: Signal 254** as signals. Change the Y-range for the VWD to 1 mAU and the offset to 20 % and the pressure offset to 50 %. The X-axis range should be 15 minutes. Press **OK** to exit this screen.

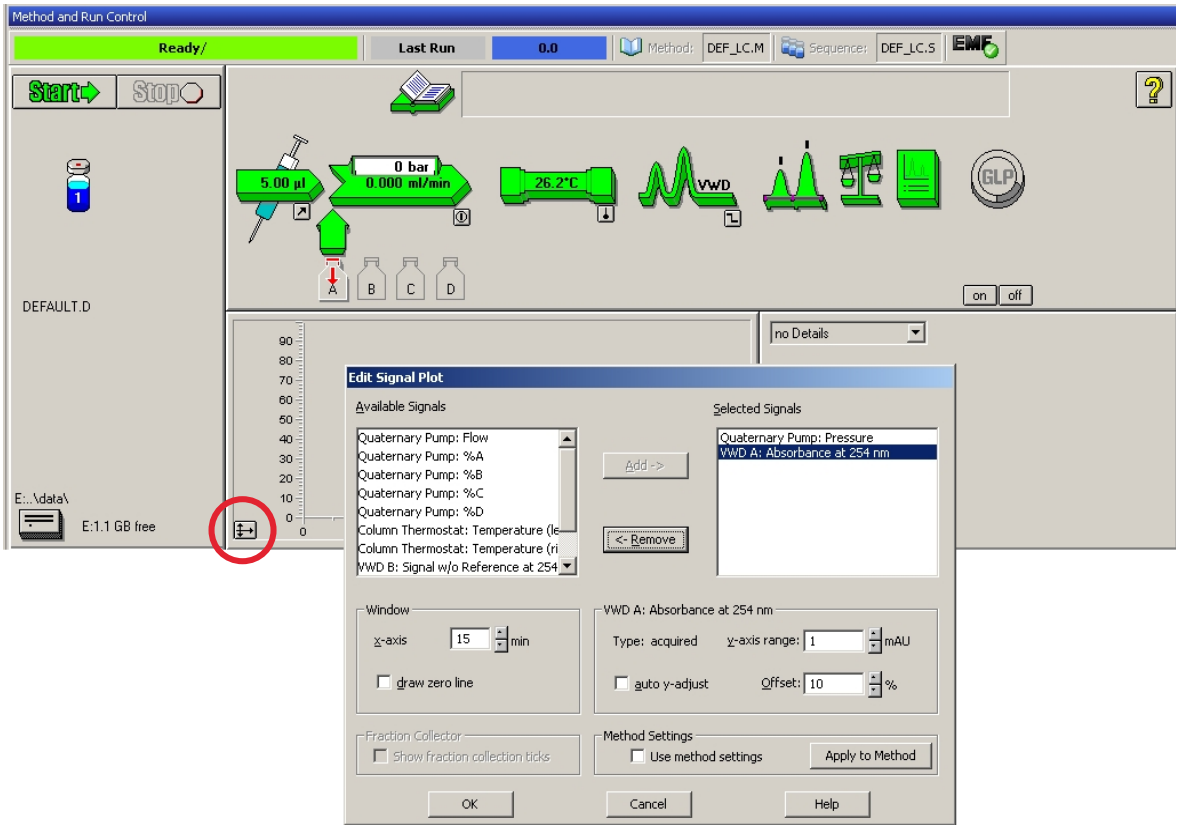


Figure 17 Edit Signal Plot Window

The Online Plot (Figure 18 on page 58) shows both, the pump pressure and the detector absorbance signals. Pressing **Adjust** the signals can be reset to the offset value and **Balance** would do a balance on the detector.

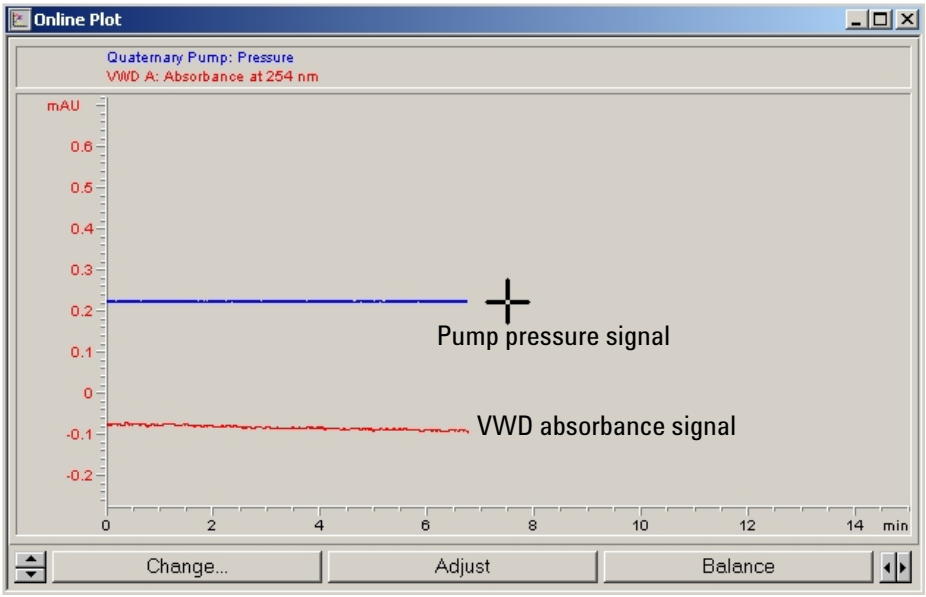


Figure 18 Online Plot Window

13 If both baselines are stable, set the Y-range for the detector signal to 100 mAU.

NOTE If you start with a new UV-lamp for the first time, the lamp may show initial drift for some time (burn-in effect).

14 Select the menu item **RunControl** > **Sample Info** and enter information about this application (Figure 19 on page 59). Press **OK** to leave this screen.

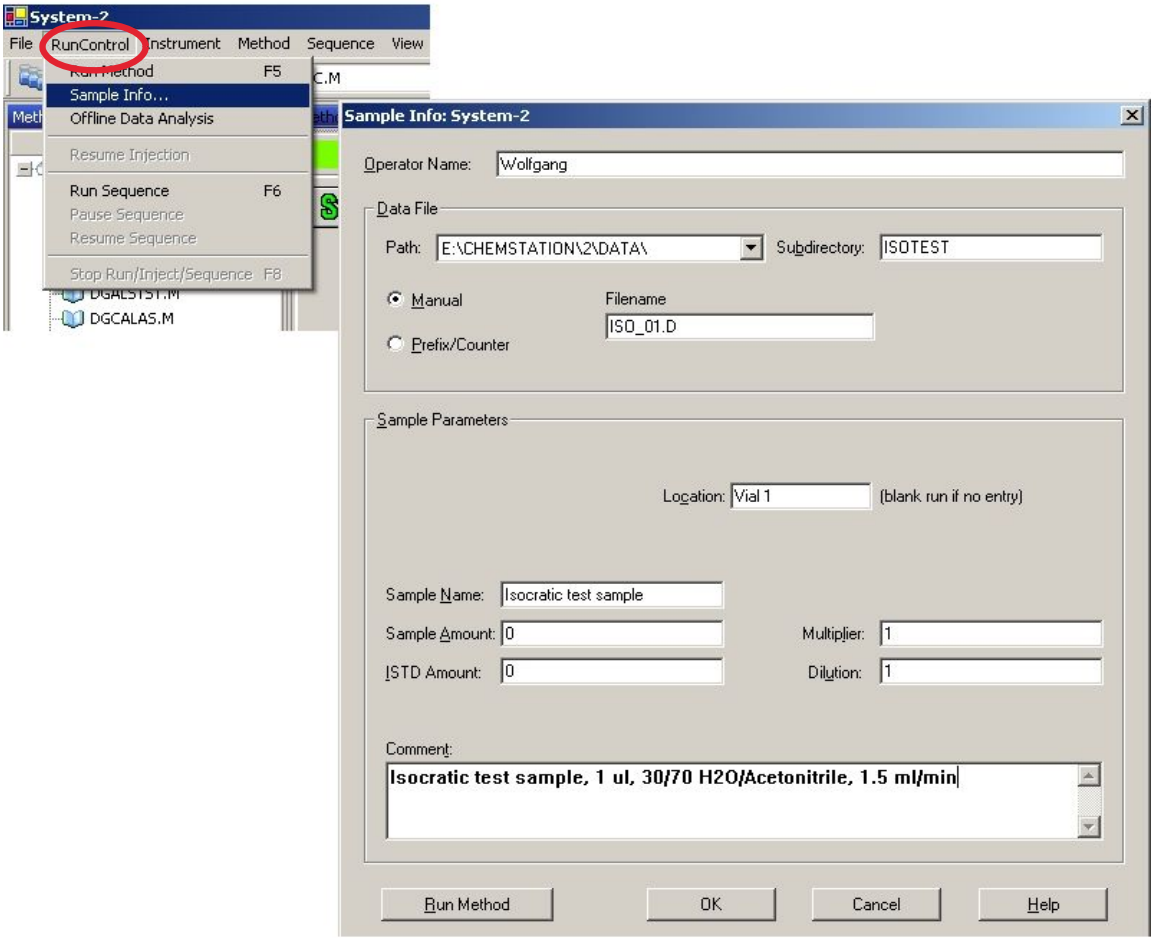


Figure 19 Sample Information

15 Fill the content of an isocratic standard sample ampoule into a vial and seal the vial with a cap and place the vial into autosampler tray (position #1).

Running the Sample and Verifying the Results

1 To start a run select the menu item **RunControl** > **Run Method**.

2 This will start the modules and the online plot on the Agilent ChemStation will show the resulting chromatogram.

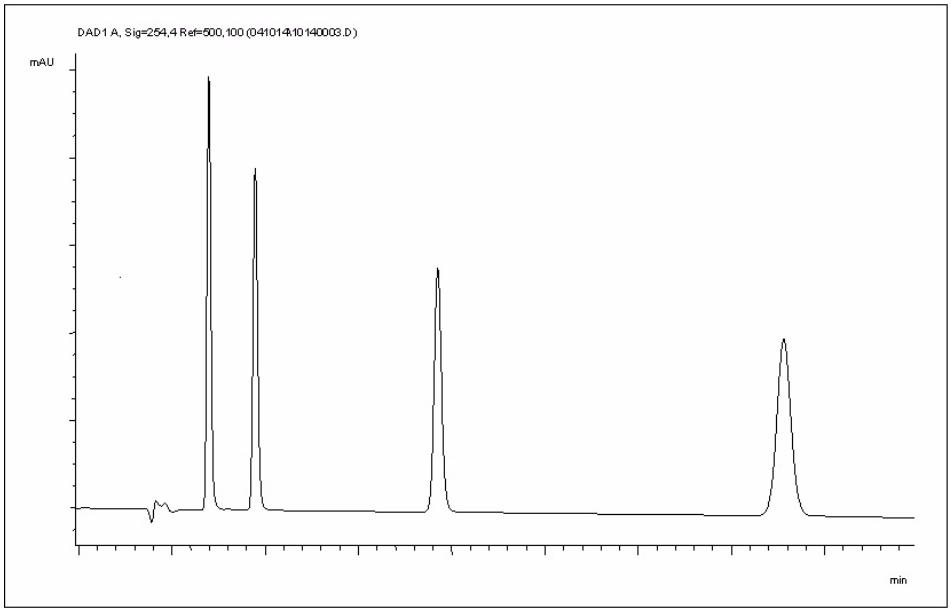


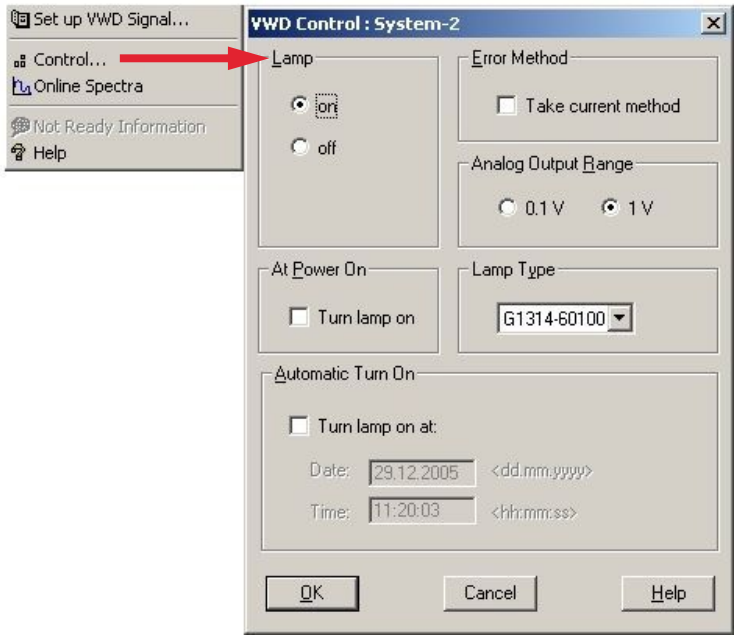
Figure 20 Chromatogram with Isocratic Test Sample

NOTE Information about using the Data Analysis functions can be obtained from the Using your ChemStation manual supplied with your system.

Special Settings of the Detector

In this chapter special settings of the detector are described.

Control Settings



- **Lamp**: turn on and off of UV-lamp.
- **At Power On**: automatic lamp-on at power on.
- **Error Method**: take error method or current method (in case of an error).
- **Analog Output Range**: can be set to either 100 mV or 1 V full scale, see "Analog Output Settings" on page 64.
- **Lamp Type**: can be set to either G1314-60100 (standard VWD lamp) or 2140-0590 (DAD lamps), see also "Exchanging a Lamp" on page 119.
- **Automatic Turn On**: lamps can be programmed (detector must be on for this).
- **Help**: online help.

Figure 21 Detector control settings

Online Spectra

1 To view the online spectra select **Online Spectra**.

NOTE This online spectrum is taken during a stop-flow condition only while the peak is kept in the flow cell, see "Scanning with the VWD" on page 63.

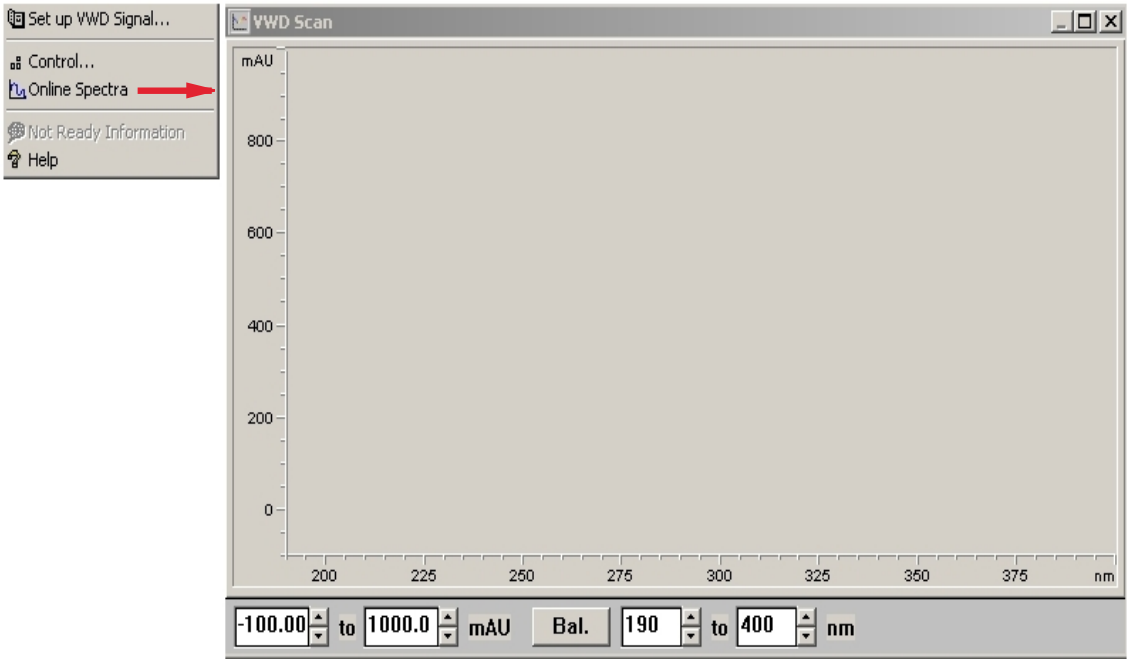


Figure 22 Online Spectra Window

2 Change the absorbance and wavelength range according your needs.

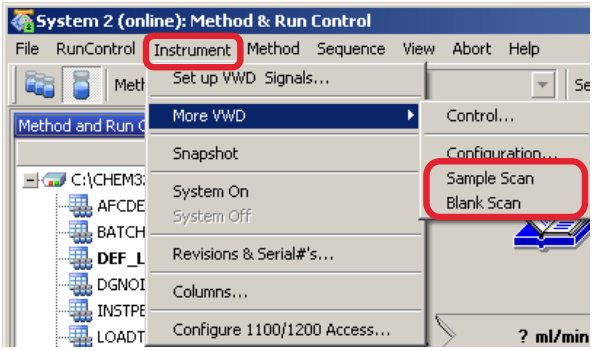
Scanning with the VWD

1 Set up a run.

2 Start a run.

3 While running on the baseline, select from the menu **Instrument** > **More VWD** > **Blank Scan**.

A background scan is stored in the memory.



- *Step 1:* **Blank Scan**: scan of the background (solvent) is stored in the memory.
- *Step 2:* **Sample Scan**: scan of the peak of interest is taken while the peak stays in the flow cell (stop-flow condition).
- **Online Spectrum**: **Sample Scan** minus **Blank Scan**.

4 When the peak of interest enters the flow cell, stop the flow (set flow rate to zero or open the purge valve) and wait a few moments to stabilize the concentration.

NOTE Turning off the pump would stop the run and no access to the sample scan is possible.

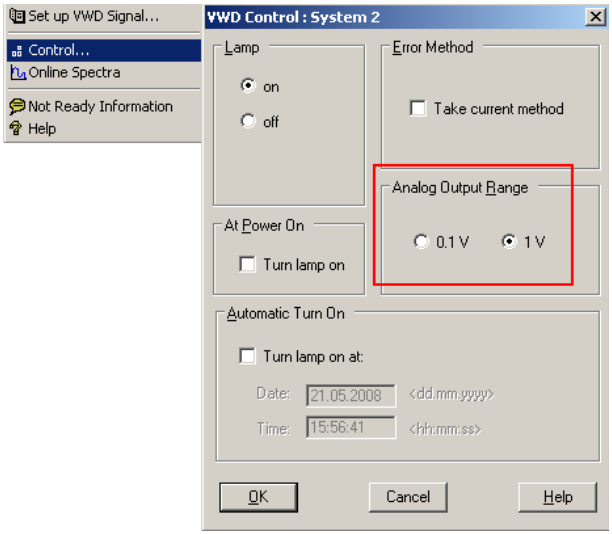
5 Select from the menu **Instrument > More VWD > Sample Scan**.

A sample scan is taken in the range defined under "Special Setpoints" on page 65 and the Online Spectra window (see "Online Spectra" on page 62) displays the result (Sample Scan minus Blank Scan).

Analog Output Settings

1 To change the Output Range of the analog outputs select **VWD Control**.

2 To change the offset and the attenuation select **VWD Signal** > **More**.



- **Analog Output Range**: can be set to either 100 mV or 1 V full scale.
- **Zero Offset**:can be set to either 100 mV or 1 V full scale.
- **Attenuation Limits**: 0.98 to 4000 mAU at discrete values for either 100 mV or 1 V full scale.

Figure 23 Analog Output Settings

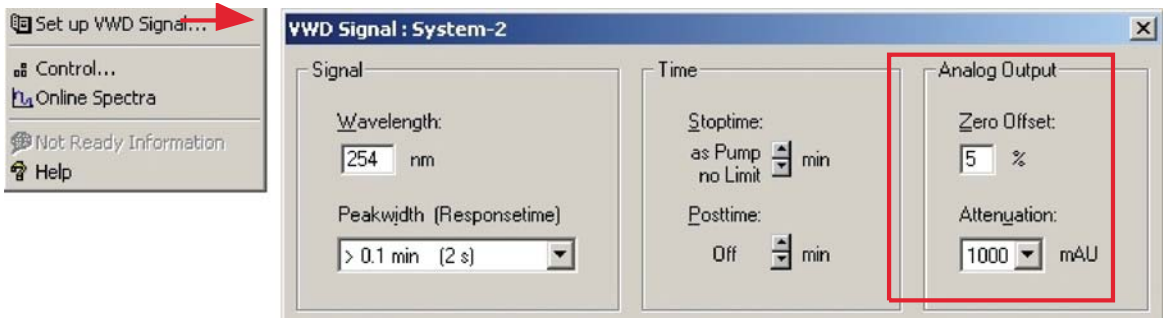


Figure 24 Analog Output Settings

3 Change the values if required.

Special Setpoints

1 To change the offset and the attenuation select **VWD Signal > More > Special Setpoints**.

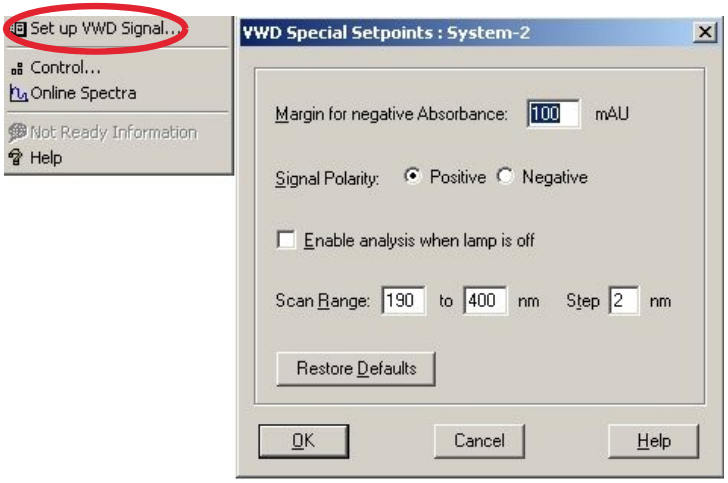


Figure 25 Spectra Window

- **Margin for negative Absorbance:** Use this field to modify the detector's signal handling to increase the margin for negative absorbance. Use this option if, for example, your solvent gradient produces a decreasing baseline absorbance, and for GPC analyses.

  Limits: 100 – 4000 mAU.
- **Signal Polarity:** can be switched to negative (if required).
- **Enable analysis when lamp is off:** if the VWD is not used in a dual detector setup (lamp off), the not-ready condition is not stopping the analysis.
- **Scan Range / Step:** Used for stop-flow scanning, see "Scanning with the VWD" on page 63.

NOTE **Margin for negative Absorbance**: The higher the value the greater the baseline noise. Set this value only if you expect negative absorbance greater than -100 mAU.

Peakwidth Settings

NOTE Do not use peak width shorter than necessary, see also "Set the Detector Parameters" on page 74.

1 To change the Peakwidth settings select **Setup Detector Signals**.

2 In the section **Peakwidth (Responsetime)** click on the drop-down list.

3 Change the Peakwidth according to your needs.

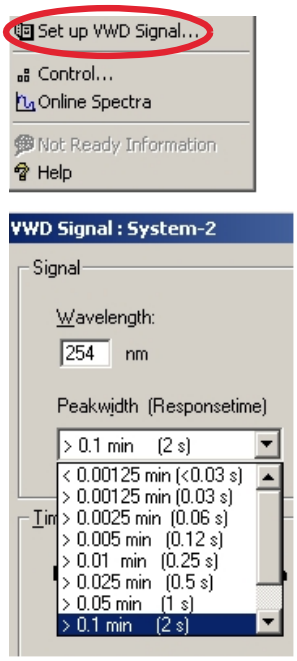


Figure 26 Peakwidth Setting

Peakwidth enables you to select the peak width (response time) for your analysis. The peak width is defined as the width of a peak, in minutes, at half the peak height. Set the peak width to the narrowest expected peak in your chromatogram. The peak width sets the optimum response time for your detector. The peak detector ignores any peaks that are considerably narrower, or wider, than the peak width setting. The response time is the time between 10 % and 90 % of the output signal in response to an input step function. When the All spectrum storage option is selected, then spectra are acquired continuously depending on the setting of the peak width. The time specified by the peak width is used as a factor in the acquisition of spectra. The acquisition time for one spectrum is slightly less than the peak width divided by 8, see Table 9 on page 67 and Table 10 on page 67.

Limits: When you set the peak width (in minutes), the corresponding response time is set automatically and the appropriate data rate for signal acquisition is selected as shown in Table 9 on page 67 and Table 10 on page 67.

Table 9 Peak Width — Response Time — Data Rate (G1314B VWD)

Peak Width (min)[1]	Response Time (s)	Data Rate (Hz)
<0.005	0.12	13.74
>0.005	0.12	13.74
>0.01	0.25	13.74
>0.025	0.5	13.74
>0.05	1.0	6.87
>0.10	2.0	3.43
>0.20	4.0	1.72
>0.40	8.0	0.86

1 Values in the User Interface may be rounded.

Table 10 Peak Width — Response Time — Data Rate (G1314C VWD SL)

Peak Width (min)[1]	Response Time (s)	Data Rate (Hz)
<0.00125	<0.031	55
>0.00125	0.031	27.5
>0.0025	0.062	13.74
>0.005	0.12	13.74
>0.01	0.25	13.74
>0.025	0.5	13.74
>0.05	1.0	6.87
>0.10	2.0	3.43
>0.20	4.0	1.72
>0.40	8.0	0.86

1 Values in the User Interface may be rounded.

5
How to optimize the detector

Optimizing the Detector Performance 70
Match the Flow Cell to the Column 71
Set the Detector Parameters 74

This chapter gives hints on how to select the detector parameters and the flow cell.

Optimizing the Detector Performance

The detector has a variety of parameters that can be used to optimize performance.

The information below will guide you on how to get the best detector performance. Follow these rules as a start for new applications. It gives a rule-of-thumb for optimizing the detector parameters.

Match the Flow Cell to the Column

Figure 27 on page 71 recommends the flow cell that matches the column used. If more than one selection is appropriate, use the larger flow cell to get the best detection limit. Use the smaller flow cell for best peak resolution.

Standard HPLC Applications

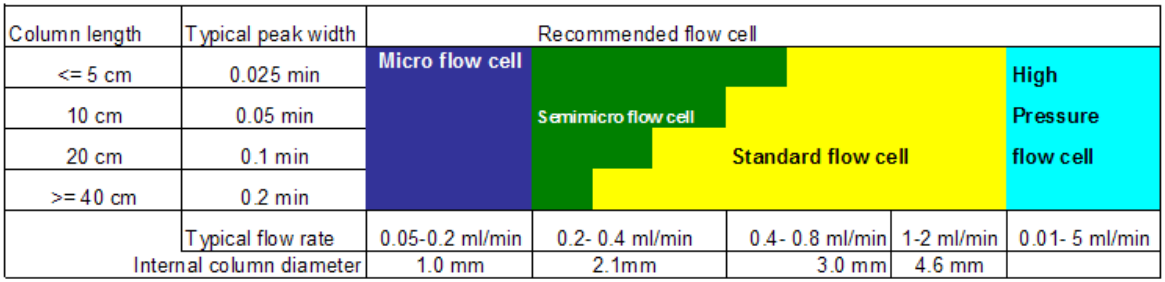


Figure 27 Choosing a Flow Cell (Standard HPLC Applications)

Flow Cell Path Length

Lambert-Beer's law shows a linear relationship between the flow cell path length and absorbance.

$$\text{Absorbance} = -\log T = \log \frac{I_0}{I} = \varepsilon \times C \times d$$

where

T	is the transmission, defined as the quotient of the intensity of the transmitted light I divided by the intensity of the incident light, I_0,
e	is the extinction coefficient, which is a characteristic of a given substance under a precisely-defined set of conditions of wavelength, solvent, temperature and other parameters,
C [mol/L]	is the concentration of the absorbing species,
d [cm]	is the path length of the cell used for the measurement.

Therefore, flow cells with longer path lengths yield higher signals. Although noise usually increases little with increasing path length, there is a gain in signal-to-noise ratio. For example, in Figure 28 on page 73 the noise increased by less than 10 % but a 70 % increase in signal intensity was achieved by increasing the path length from 6 mm to 10 mm.

When increasing the path length, the cell volume usually increases – in the example from 5 – 14 µL. Typically, this causes more peak dispersion. As demonstrated, this did not affect the resolution in the gradient separation in the example shown below.

As a rule-of-thumb the flow cell volume should be about 1/3 of the peak volume at half height. To determine the volume of your peaks, take the peak width as reported in the integration results multiply it by the flow rate and divide it by 3).

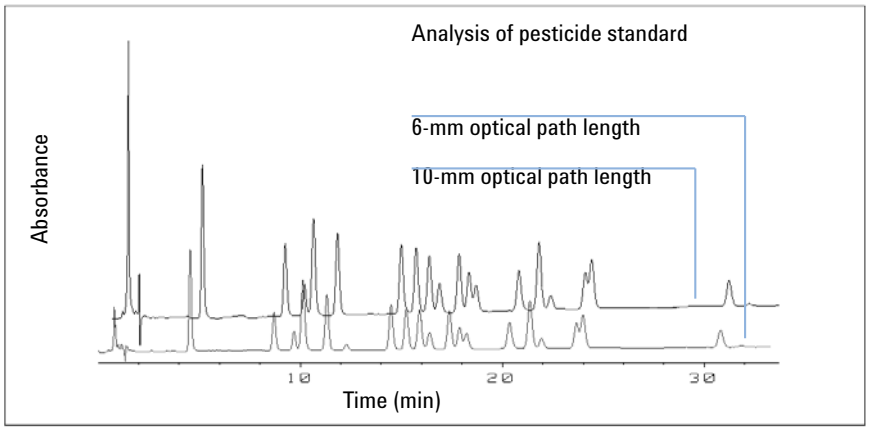


Figure 28 Influence of Cell Path Length on Signal Height

Traditionally LC analysis with UV detectors is based on comparing measurements with internal or external standards. To check photometric accuracy of the Agilent 1200 Series Infinity Variable Wavelength Detector it is necessary to have more precise information on path lengths of the VWD flow cells.

The correct response is:

expected response * correction factor

Please find below the details of the Agilent 1200 Infinity Series Variable Wavelength Detector flow cells:

Table 11 Correction factors for Agilent VWD flow cells (G1314B/G1314C)

Part number	Path length (actual)	Correction factor
Standard flow cell, 10 mm, 14 µL, 40 bar (p/n G1314-60086)	10.15 ± 0.19 mm	10/ 10.15
Semi-micro flow cell, 6 mm, 5 µL, 40 bar (p/n G1314-60083)	6.10 ± 0.19 mm	6/6.10
Micro flow cell, without I.D. tag, 3 mm, 2 µL, 120 bar (p/n G1314-60087)	2.80 ± 0.19 mm	3/2.80
High pressure flow cell, 10 mm, 14 µL, 400 bar (p/n G1314-60082)	10.00 ± 0.19 mm	10/10

NOTE However you have to be aware that there are additional tolerance of gasket thickness and its compression ratio which is supposed to be very small in comparison with the machining tolerance.

Set the Detector Parameters

1. Set peakwidth as close as possible to the width (at half height) of a narrow peak of interest. Refer to "Peakwidth Settings" on page 66.
2. Choose the sample wavelength
   - at a longer wavelength than the cut-off wavelength of the mobile phase,
   - at a wavelength where the analytes have strong absorptivity if you want to get the lowest possible detection limit,
   - at a wavelength with moderate absorptivity if you work with high concentrations, and
   - preferably where the spectrum is flat for better linearity.
3. Consider to use time-programming to further optimization.

6
Troubleshooting and Diagnostics

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Module Status Indicator 78
Available Tests versus Interfaces 79
Agilent Lab Advisor Software 80

Overview about the troubleshooting and diagnostic features.

Overview of the Detector's Indicators and Test Functions

Status Indicators

The detector is provided with two status indicators which indicate the operational state (prerun, run, and error states) of the detector. The status indicators provide a quick visual check of the operation of the detector.

Error Messages

In the event of an electronic, mechanical or hydraulic failure, the detector generates an error message in the user interface. For each message, a short description of the failure, a list of probable causes of the problem, and a list of suggested actions to fix the problem are provided.

Test Functions

A series of test functions are available for troubleshooting and operational verification after exchanging internal components.

Wavelength Verification / Recalibration

Wavelength recalibration is recommended after repair of internal components, and on a regular basis to ensure correct operation of the detector. The detector uses the deuterium alpha and beta emission lines for wavelength calibration.

Diagnostic Signals

The detector has several signals (internal temperatures, voltages and currents of lamps) that can be used for diagnosing baseline problems.

Status Indicators

Two status indicators are located on the front of the detector. The lower left indicates the power supply status, the upper right indicates the detector status.

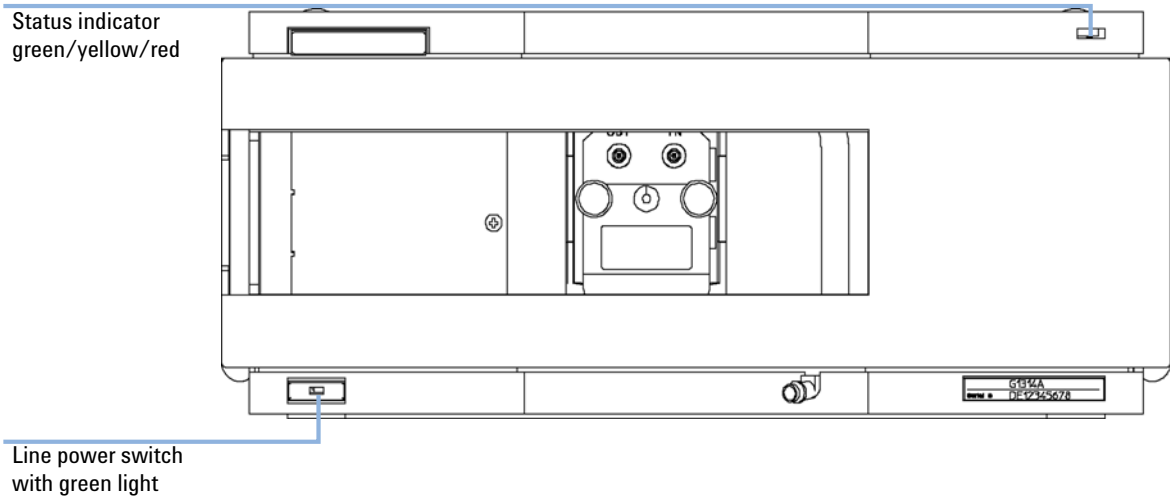

Figure 29 Location of Status Indicators

Power Supply Indicator

The power supply indicator is integrated into the main power switch. When the indicator is illuminated (*green*) the power is ON.

Module Status Indicator

The module status indicator indicates one of six possible module conditions:

- When the status indicator is *OFF* (and power switch light is on), the module is in a *prerun* condition, and is ready to begin an analysis.
- A *green* status indicator, indicates the module is performing an analysis (*run* mode).
- A *yellow* indicator indicates a *not-ready* condition. The module is in a not-ready state when it is waiting for a specific condition to be reached or completed (for example, immediately after changing a set point), or while a self-test procedure is running.
- An *error* condition is indicated when the status indicator is *red*. An error condition indicates the module has detected an internal problem which affects correct operation of the module. Usually, an error condition requires attention (e.g. leak, defective internal components). An error condition always interrupts the analysis.

  If the error occurs during analysis, it is propagated within the LC system, i.e. a red LED may indicate a problem of a different module. Use the status display of your user interface for finding the root cause/module of the error.
- A *yellow-blinking* indicator indicates that the module is in resident mode (e.g. during update of main firmware).
- A *fast yellow-blinking* indicator indicates that the module is in boot loader mode (e.g. during update of main firmware). In such as case try to re-boot the module or try a cold-start.

Available Tests versus Interfaces

NOTE

Depending on the used interface, the available tests and the screens/reports may vary.

Preferred tool should be the Agilent Diagnostic Software, see "Agilent Lab Advisor Software" on page 80.

In future, a user interface may not show the Diagnostics/Tests anymore. Then the Agilent Diagnostic Software must be used instead.

The Agilent ChemStation may not include any maintenance/test functions.

Table 12 Available Tests versus Interface

Interface Test	Lab Advisor	ChemStation	Instant Pilot G4208A
Wavelength Verification/Re-calibration	Calibration [1]	Tests [1]	Maintenance [1]
Lamp Intensity Test	Tests [1]	Tests [1]	Diagnosis [1]
ASTM Drift and Noise Test	Tests [1]	n/a	n/a
Quick Noise Test	Tests [1]	n/a	n/a
Holmium Test	Tests [1]	Tests [1]	Diagnosis [1]
Cell Test	Tests [1]	Tests [1]	n/a
D/A Converter Test	Tests [1]	Tests [1]	n/a
Dark Current Test	Tests [1]	Tests [1]	n/a
Filter / Grating Motor Test	Tests [1]	Tests [1]	n/a
Test Chromatogram	Tools	from command line	n/a
Spectrum (Blank, Sample, Holmium)	Tools	n/a	n/a

[1] interface provides passed/fail information or a plot

Agilent Lab Advisor Software

The Agilent Lab Advisor software is a standalone product that can be used with or without data system. Agilent Lab Advisor software helps to manage the lab for high quality chromatographic results and can monitor in real time a single Agilent LC or all the Agilent GCs and LCs configured on the lab intranet.

Agilent Lab Advisor software provides diagnostic capabilities for all Agilent 1200 Infinity Series modules. This includes diagnostic capabilities, calibration procedures and maintenance routines for all the maintenance routines.

The Agilent Lab Advisor software also allows users to monitor the status of their LC instruments. The Early Maintenance Feedback (EMF) feature helps to carry out preventive maintenance. In addition, users can generate a status report for each individual LC instrument. The tests and diagnostic features as provided by the Agilent Lab Advisor software may differ from the descriptions in this manual. For details refer to the Agilent Lab Advisor software help files.

The Instrument Utilities is a basic version of the Lab Advisor with limited functionality required for installation, use and maintenance. No advanced repair, troubleshooting and monitoring functionality is included.

7
Error Information

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This chapter describes the meaning of detector error messages, and provides information on probable causes and suggested actions how to recover from error conditions.

What Are Error Messages

Error messages are displayed in the user interface when an electronic, mechanical, or hydraulic (flow path) failure occurs which requires attention before the analysis can be continued (for example, repair, or exchange of consumables is necessary). In the event of such a failure, the red status indicator at the front of the module is switched on, and an entry is written into the module logbook.

General Error Messages

General error messages are generic to all Agilent 1200 Infinity Series modules.

Timeout

Error ID: 0062

The timeout threshold was exceeded.

Probable cause	Suggested actions
1 The analysis was completed successfully, and the timeout function switched off the module as requested.	Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.
2 A not-ready condition was present during a sequence or multiple-injection run for a period longer than the timeout threshold.	Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.

Shutdown

Error ID: 0063

An external instrument has generated a shutdown signal on the remote line.

The module continually monitors the remote input connectors for status signals. A LOW signal input on pin 4 of the remote connector generates the error message.

Probable cause	Suggested actions
1 Leak detected in another module with a CAN connection to the system.	Fix the leak in the external instrument before restarting the module.
2 Leak detected in an external instrument with a remote connection to the system.	Fix the leak in the external instrument before restarting the module.
3 Shut-down in an external instrument with a remote connection to the system.	Check external instruments for a shut-down condition.
4 The degasser failed to generate sufficient vacuum for solvent degassing.	Check the vacuum degasser for an error condition. Refer to the *Service Manual* for the degasser or the 1260 pump that has the degasser built-in.

Remote Timeout

Error ID: 0070

A not-ready condition is still present on the remote input. When an analysis is started, the system expects all not-ready conditions (for example, a not-ready condition during detector balance) to switch to run conditions within one minute of starting the analysis. If a not-ready condition is still present on the remote line after one minute the error message is generated.

Probable cause	Suggested actions
1 Not-ready condition in one of the instruments connected to the remote line.	Ensure the instrument showing the not-ready condition is installed correctly, and is set up correctly for analysis.
2 Defective remote cable.	Exchange the remote cable.
3 Defective components in the instrument showing the not-ready condition.	Check the instrument for defects (refer to the instrument's documentation).

Lost CAN Partner

Error ID: 0071

During an analysis, the internal synchronization or communication between one or more of the modules in the system has failed.

The system processors continually monitor the system configuration. If one or more of the modules is no longer recognized as being connected to the system, the error message is generated.

Probable cause	Suggested actions
1 CAN cable disconnected.	• Ensure all the CAN cables are connected correctly. • Ensure all CAN cables are installed correctly.
2 Defective CAN cable.	Exchange the CAN cable.
3 Defective main board in another module.	Switch off the system. Restart the system, and determine which module or modules are not recognized by the system.

Leak

Error ID: 0064

A leak was detected in the module.

The signals from the two temperature sensors (leak sensor and board-mounted temperature-compensation sensor) are used by the leak algorithm to determine whether a leak is present. When a leak occurs, the leak sensor is cooled by the solvent. This changes the resistance of the leak sensor which is sensed by the leak-sensor circuit on the main board.

Probable cause	Suggested actions
1 Loose fittings.	Ensure all fittings are tight.
2 Broken capillary.	Exchange defective capillaries.
3 Leaking flow cell.	Exchange flow cell components.

Leak Sensor Open

Error ID: 0083

The leak sensor in the module has failed (open circuit).

The current through the leak sensor is dependent on temperature. A leak is detected when solvent cools the leak sensor, causing the leak-sensor current to change within defined limits. If the current falls outside the lower limit, the error message is generated.

Probable cause	Suggested actions
1 Leak sensor not connected to the main board.	Please contact your Agilent service representative.
2 Defective leak sensor.	Please contact your Agilent service representative.
3 Leak sensor incorrectly routed, being pinched by a metal component.	Please contact your Agilent service representative.

Leak Sensor Short

Error ID: 0082

The leak sensor in the module has failed (short circuit).

The current through the leak sensor is dependent on temperature. A leak is detected when solvent cools the leak sensor, causing the leak sensor current to change within defined limits. If the current increases above the upper limit, the error message is generated.

Probable cause	Suggested actions
1 Defective leak sensor.	Please contact your Agilent service representative.
2 Leak sensor incorrectly routed, being pinched by a metal component.	Please contact your Agilent service representative.

Compensation Sensor Open

Error ID: 0081

The ambient-compensation sensor (NTC) on the main board in the module has failed (open circuit).

The resistance across the temperature compensation sensor (NTC) on the main board is dependent on ambient temperature. The change in resistance is used by the leak circuit to compensate for ambient temperature changes. If the resistance across the sensor increases above the upper limit, the error message is generated.

Probable cause	Suggested actions
1 Defective main board.	Please contact your Agilent service representative.

Compensation Sensor Short

Error ID: 0080

The ambient-compensation sensor (NTC) on the main board in the module has failed (short circuit).

The resistance across the temperature compensation sensor (NTC) on the main board is dependent on ambient temperature. The change in resistance is used by the leak circuit to compensate for ambient temperature changes. If the resistance across the sensor falls below the lower limit, the error message is generated.

Probable cause	Suggested actions
1 Defective main board.	Please contact your Agilent service representative.

Fan Failed

Error ID: 0068

The cooling fan in the module has failed.

The hall sensor on the fan shaft is used by the main board to monitor the fan speed. If the fan speed falls below a certain limit for a certain length of time, the error message is generated.

This limit is given by 2 revolutions/second for longer than 5 seconds.

Depending on the module, assemblies (e.g. the lamp in the detector) are turned off to assure that the module does not overheat inside.

Probable cause	Suggested actions
1 Fan cable disconnected.	Please contact your Agilent service representative.
2 Defective fan.	Please contact your Agilent service representative.
3 Defective main board.	Please contact your Agilent service representative.

Open Cover

Error ID: 0205

The top foam has been removed.

The sensor on the main board detects when the top foam is in place. If the foam is removed during operation, the lamp and grating drive power is switched off, and the error message is generated.

Probable cause	Suggested actions
1 The top foam was removed during operation.	Please contact your Agilent service representative.
2 Foam not activating the sensor.	Please contact your Agilent service representative.
3 Dirty or defective sensor.	Please contact your Agilent service representative.

Detector Error Messages

These errors are detector specific.

UV lamp: no current

Error ID: 7450

The lamp anode current is missing. The processor continually monitors the anode current drawn by the lamp during operation. If the anode current falls below the lower current limit, the error message is generated.

Probable cause	Suggested actions
1 Lamp disconnected.	Ensure the lamp connector is seated firmly.
2 Top foam removed while lamp is on.	Please contact your Agilent service representative.
3 Defective or non-Agilent lamp.	Exchange the lamp.
4 Defective main board.	Please contact your Agilent service representative.
5 Defective power supply.	Please contact your Agilent service representative.

UV lamp: no voltage

Error ID: 7451

The lamp anode voltage is missing. The processor continually monitors the anode voltage across the lamp during operation. If the anode voltage falls below the lower limit, the error message is generated.

Probable cause	Suggested actions
1 Defective or non-Agilent lamp.	Exchange the lamp.
2 Defective power supply.	Please contact your Agilent service representative.
3 Defective main board.	Please contact your Agilent service representative.

Ignition Failed

Error ID: 7452

The lamp failed to ignite. The processor monitors the lamp current during the ignition cycle. If the lamp current does not rise above the lower limit within 2 – 5 s, the error message is generated.

Probable cause	Suggested actions
1 Lamp disconnected.	Ensure the lamp is connected.
2 Defective or non-Agilent lamp.	Exchange the lamp.
3 Defective power supply.	Please contact your Agilent service representative.
4 Defective main board.	Please contact your Agilent service representative.

No heater current

Error ID: 7453

The lamp heater current in the detector is missing. During lamp ignition, the processor monitors the heater current. If the current does not rise above the lower limit within 1 , the error message is generated.

Probable cause	Suggested actions
1 Lamp disconnected.	Ensure the lamp is connected.
2 Ignition started without the top foam in place.	Please contact your Agilent service representative.
3 Defective main board.	Please contact your Agilent service representative.
4 Defective or non-Agilent lamp.	Exchange the lamp.
5 Defective power supply.	Please contact your Agilent service representative.

Wavelength calibration setting failed

Error ID: 7310

The intensity maximum was not found during wavelength calibration.

Calibration 0 Failed:	Zero-order calibration failed.
Calibration 1 Failed:	656 nm calibration failed.

	Probable cause	Suggested actions
1	Lamp is OFF.	Switch on the lamp.
2	Incorrect flow cell installation.	Ensure the flow cell are installed correctly.
3	Flow cell contamination or air bubbles.	Clean/replace flow cell windows or remove air bubbles.
4	Intensity too low.	Replace lamp.
5	Current step value too far from maximum.	• Repeat the calibration. • Please contact your Agilent service representative.
6	Misaligned/defective grating assembly.	Please contact your Agilent service representative.
7	Defective main board.	Please contact your Agilent service representative.

Wavelength holmium check failed

Error ID: 7318

The holmium oxide test in the detector has failed. During the holmium test, the detector moves the holmium filter into the light path, and compares the measured absorbance maxima of the holmium oxide filter with expected maxima. If the measured maxima are outside the limits, the error message is generated.

Probable cause	Suggested actions
1 Misaligned/defective grating assembly.	• Ensure the flow cell is inserted correctly, and is free from contamination (cell windows, buffers, and so on). • Run the filter-motor test to determine if the filter motor assembly is defective. If defective, please contact your Agilent service representative. • Run the grating-motor test to determine if the grating assembly is defective. If defective, please contact your Agilent service representative.

Grating or Filter Motor Errors

Error ID: Grating: 7800, 7801, 7802, 7803, 7804, 7805, 7806, 7808, 7809; Filter: 7810, 7811, 7812, 7813, 7814, 7815, 7816

The motor test has failed.

Test 0 Failed:	Filter motor.
Test 1 Failed:	Grating motor.

During the motor tests, the detector moves the motor to the end position while monitoring the end-position sensor. If the end position is not found, the error message is generated.

Probable cause	Suggested actions
1 Motor is not connected.	Please contact your Agilent service representative.
2 Defective motor.	Please contact your Agilent service representative.
3 Defective/missing grating or filter.	Please contact your Agilent service representative.
4 Cable/connector defective.	Please contact your Agilent service representative.

Wavelength test failed

Error ID: 7890

The automatic wavelength check after lamp ignition has failed. When the lamp is switched on, the detector waits 1 min to warm-up the lamp. Then a check of the deuterium emission line (656 nm) via the reference diode is performed. If the emission line is more than 3 nm away from 656 nm, the error message is generated.

Probable cause	Suggested actions
1 Calibration incorrect.	Recalibrate the detector.

Cutoff filter doesn't decrease the light intensity at 250 nm

Error ID: 7813

The automatic filter check after lamp ignition has failed. When the lamp is switched on, the detector moves the cutoff filter into the light path. If the filter is functioning correctly, a decrease in lamp intensity is seen. If the expected intensity decrease is not detected, the error message is generated.

Probable cause	Suggested actions
1 Motor is not connected.	Please contact your Agilent service representative.
2 Defective motor.	Please contact your Agilent service representative.
3 Defective/missing grating or filter.	Please contact your Agilent service representative.
4 Cable/connector defective.	Please contact your Agilent service representative.

ADC Hardware Error

Error ID: 7830, 7831

A/D-Converter hardware is defective.

Probable cause	Suggested actions
1 A/D-Converter hardware is defective.	Please contact your Agilent service representative.

Cover Violation

Error ID: 7461

The top foam has been removed.

The sensor on the main board detects when the top foam is in place. If the foam is removed while the lamps are on (or if an attempt is made to switch on for example the lamps with the foam removed), the lamps are switched off, and the error message is generated.

Probable cause	Suggested actions
1 The top foam was removed during operation.	Please contact your Agilent service representative.
2 Foam not activating the sensor.	Please contact your Agilent service representative.

8
Test Functions

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Quick Noise Test 107
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This chapter describes the detector's built in test functions.

Intensity Test

The intensity test measures the intensity of the deuterium lamp over the full VWD wavelength range (190 – 600 nm). The test can be used to determine the performance of the lamp, and to check for dirty or contaminated flow cell windows. When the test is started, the gain is set to zero. To eliminate effects due to absorbing solvents, the test should be done with water in the flow cell. The shape of the intensity spectrum is primarily dependent on the lamp, grating, and diode characteristics. Therefore, intensity spectra will differ slightly between instruments. Figure 30 on page 101 shows a typical intensity test spectrum.

The Intensity Test is available in

- Agilent Lab Advisor (preferred)
- Agilent ChemStation
- Agilent Instant Pilot G4208A, via **More-Diagnosis-VWD-Lamp Intensity Test**

Intensity Test Evaluation

The Agilent LabAdvisor and the Instant Pilot evaluate three values automatically and display the limits for each value, the average, the minimum and the maximum of all data points and **passed** or **failed** for each value.

Instensity Test with Agilent Lab Advisor

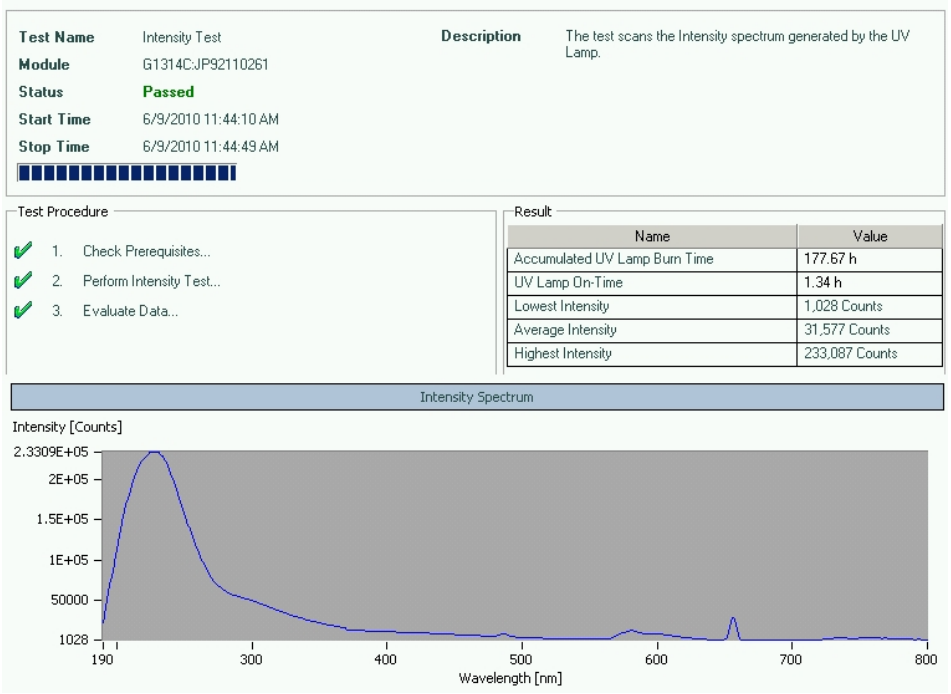


Figure 30 Intensity Test with Agilent Lab Advisor

Intensity Test Failed

Probable cause	Suggested actions
1 Empty flow cell	Ensure the flow cell is filled with water.
2 Flow cell windows dirty	Repeat the test with the flow cell removed. If the test passes, exchange the flow cell windows.
3 Optics defect	Please contact your Agilent service representative.
4 Defective lamp or optics.	Exchange the lamp.

Cell Test

The cell test compares the intensity of the deuterium lamp measured by the sample and reference diodes (unfiltered and not logarithmized) when the grating is in the zero-order position. The resulting intensity ratio (sample:reference) is a measure of the amount of light absorbed by the flow cell.

The test can be used to check for dirty or contaminated flow cell windows. When the test is started, the gain is set to -1. To eliminate effects due to absorbing solvents, the test should be done with water in the flow cell.

Limits: No real limit. The reason is that it depends on the position/alignment of the reference side (beam splitter – reference slit – reference diode). Therefore the reference side value can be higher/smaller than the sample side value.

With a clean cell the counts for sample and reference (photocurrent) are in the same range. If the sample side shows much lower values than the reference side the flow cell might have a problem.

Pre-requisite:

Flush the flow cell with a flow of 1 mL/min for at least 10 minutes.

Probable Cause	Suggested Action
Cell contaminated	Flush flow cell
Cell windows are contaminated	Clean/replace cell windows
Mechanical problem	Check cell position

In the Agilent Instant Pilot G4208A, the photocurrent readings are available via **More > Diagnosis > VWD > LampIntensity Test**, see Figure 32 on page 103.

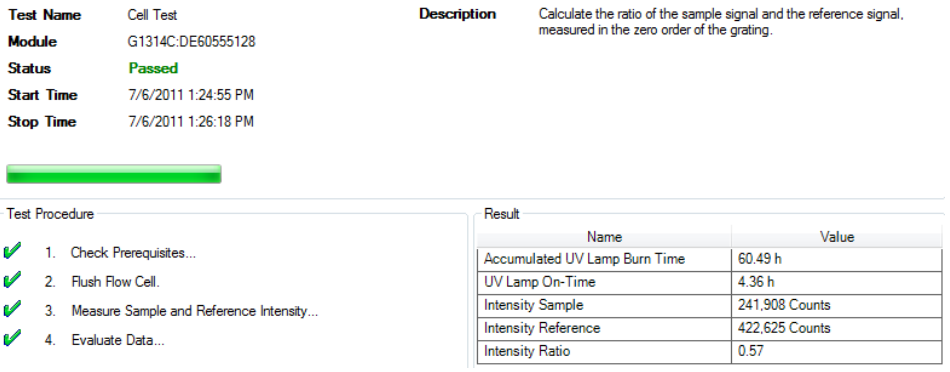


Figure 31 Cell Test with Lab Advisor

Checking the Photocurrent with the Instant Pilot

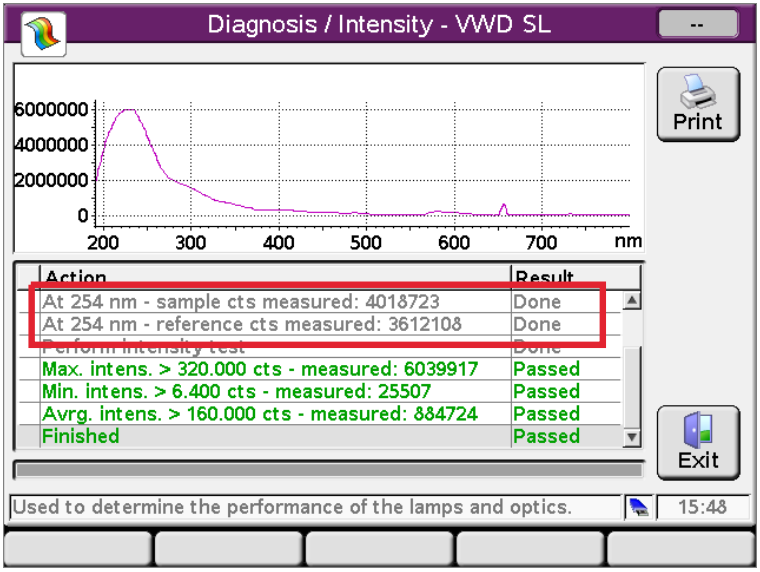


Figure 32 Checking the Photocurrent with the Instant Pilot

Wavelength Verification-Calibration

Wavelength calibration of the detector is done using the zero-order position and 656 nm emission line position of the deuterium lamp. The calibration procedure involves two steps. First the grating is calibrated on the zero-order position. The stepper-motor step position where the zero-order maximum is detected is stored in the detector. Next, the grating is calibrated against the deuterium emission-line at 656 nm, and the motor position at which the maximum occurs is stored in the detector.

In addition to the zero-order and 656 nm (alpha-emission line) calibration, the beta-emission line at 486 nm and the three holmium lines are used for the complete wavelength calibration process. These holmium lines are at 360.8 nm, 418.5 nm and 536.4 nm.

NOTE The wavelength verification/calibration takes about 2.5 min and is disabled within the first 10 min after ignition of the lamp because initial drift may distort the measurement.

When the lamp is turned **ON**, the 656 nm emission line position of the deuterium lamp is checked automatically.

The Wavelength Verification/Calibration is available in

- Agilent Lab Advisor (preferred tool).
- Agilent Instant Pilot G4208A, via **More-Diagnosis-VWD-Calibration**.

When to Calibrate the Detector

The detector is calibrated at the factory, and under normal operating conditions should not require recalibration. However, it is advisable to recalibrate:

- after maintenance (flow cell or lamp),
- after repair of components in the optical unit,
- after exchange of the optical unit or VWM board,
- at a regular interval, at least once per year (for example, prior to an Operational Qualification/Performance Verification procedure), and
- when chromatographic results indicate the detector may require recalibration.

Wavelength Verification/Calibration with Agilent LabAdvisor

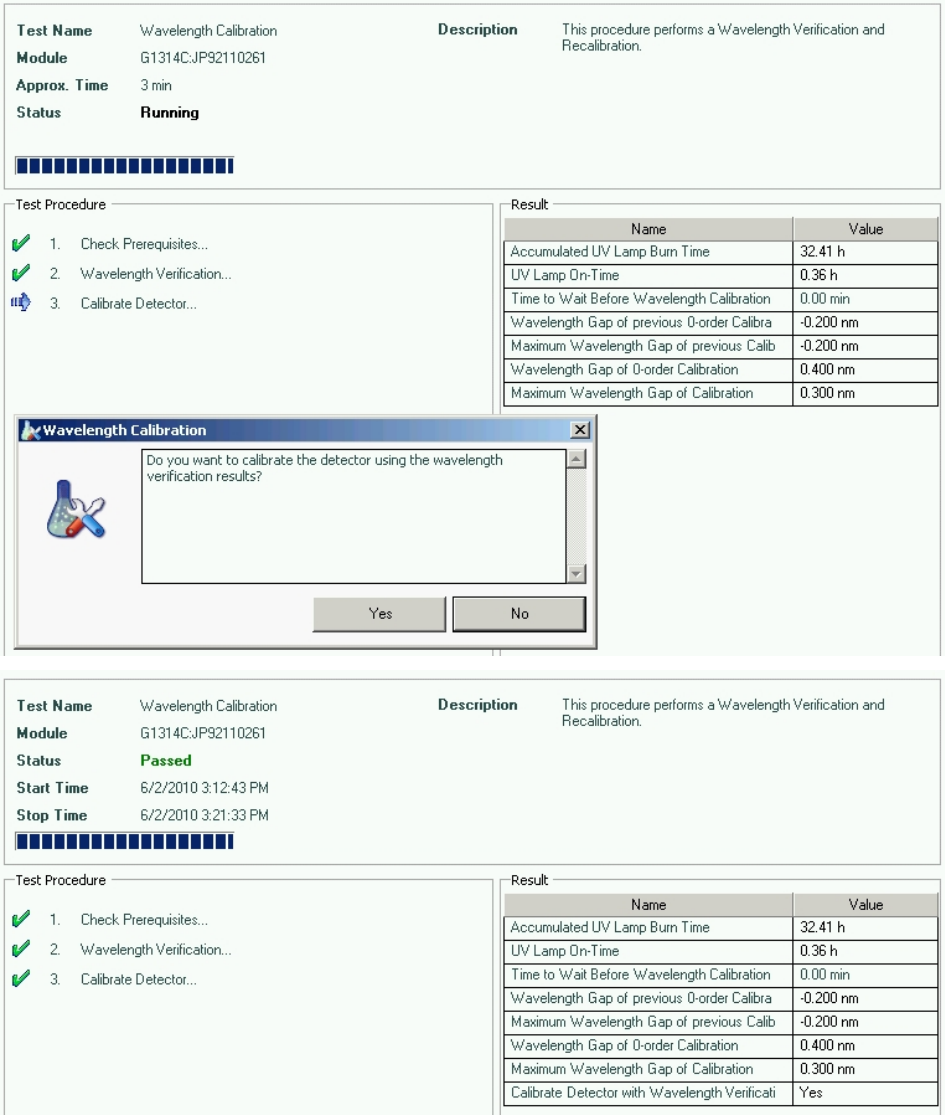


Figure 33 Wavelength Verification and Calibration (Agilent Lab Advisor)

ASTM Drift and Noise Test

The ASTM Drift and Noise test determines the detector noise over a period of 20 min. The test is done with HPLC-grade water flowing through the flow cell at 1 mL/min. On completion of the test, the noise result is displayed automatically.

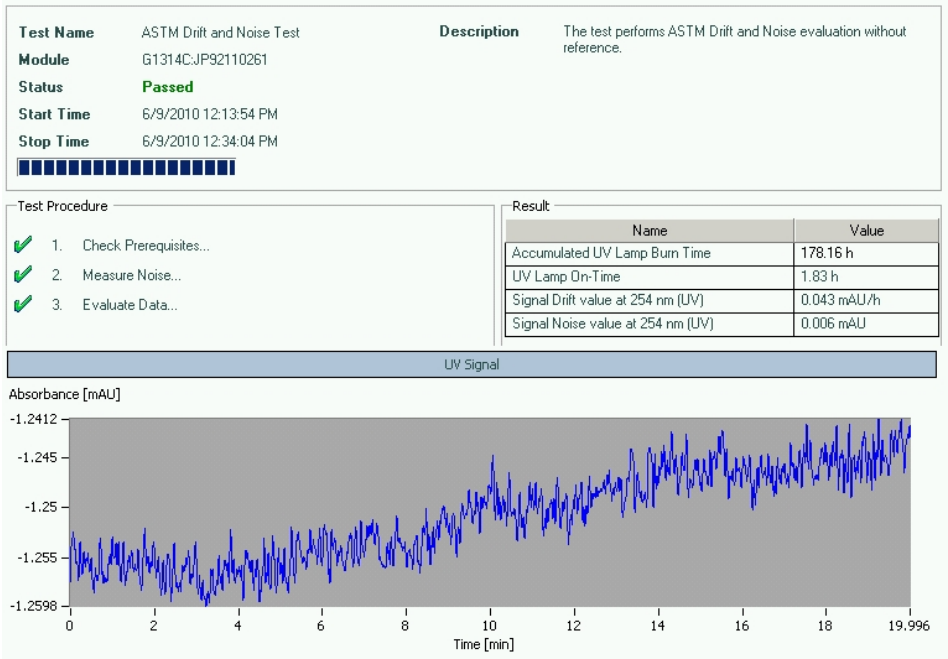


Figure 34 ASTM Drift and Noise Test (Agilent Lab Advisor)

Quick Noise Test

The noise test measures the noise of the detector, with HPLC-grade water flowing through the flow cell at 1 mL/min, in one minute intervals over a total of 5 min.

The noise of the detector is calculated by using the maximum amplitude for all random variations of the detector signal of frequencies greater than one cycle per hour. The noise is determined for 5 one minute intervals and is based on the accumulated peak-to-peak noise for the intervals. At least seven data points per cycles are used in the calculation.

The cycles in the noise determination are not overlapping.

In order to obtain reliable results, the lamp should be turned on for at least 10 min prior to measurement.

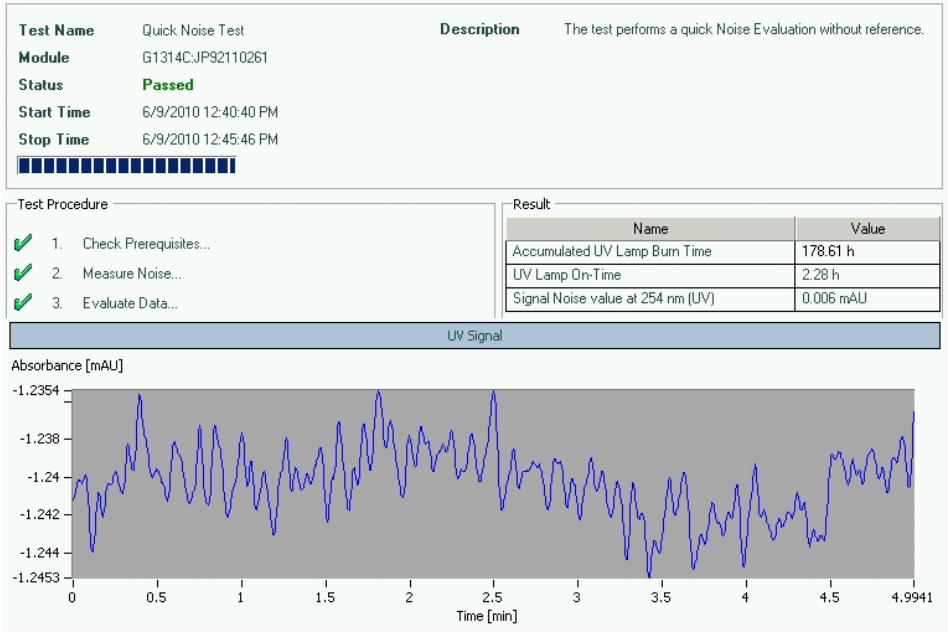


Figure 35 Quick Noise Test (Agilent Lab Advisor)

Dark Current Test

The dark-current test measures the leakage current from the sample and reference circuits. The test is used to check for defective sample or reference diodes or ADC circuits which may cause non-linearity or excessive baseline noise. During the test, the lamp is switched off. Next, the leakage current from both diodes is measured.

Dark Current Test Failed

Probable cause	Suggested actions
1 Defective sample or reference diode.	Please contact your Agilent service representative.
2 Defective sample or reference ADC board.	Please contact your Agilent service representative.
3 Defective main board.	Please contact your Agilent service representative.

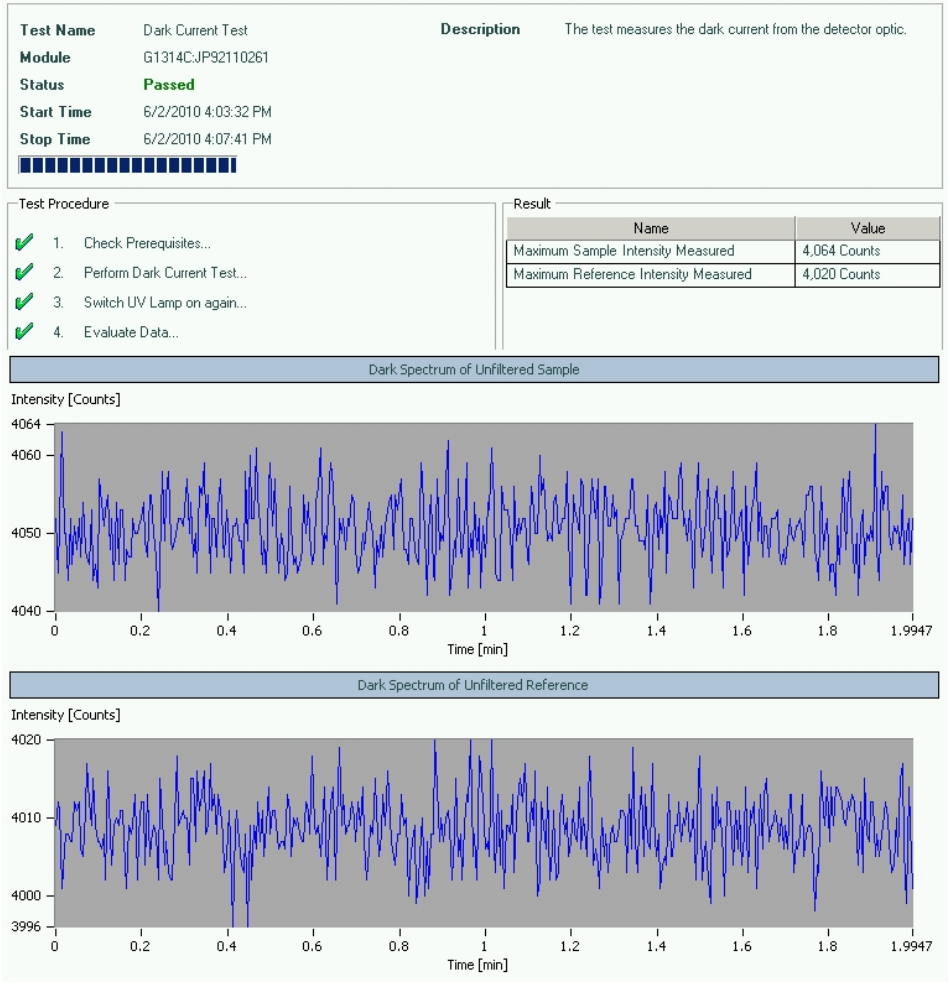


Figure 36 Dark Current Test (Agilent Lab Advisor)

Holmium Oxide Test

This test verifies the calibration of the detector against the three wavelength maxima of the built-in holmium oxide filter. The test displays the difference between the expected and measured maxima. The figure below shows a holmium test spectrum.

The Holmium Oxide Test is available in

- Agilent Lab Advisor (preferred tool).
- Agilent Instant Pilot G4208A, via **More-Diagnosis-VWD-Holmium Spectrum Test**.

The test uses the following holmium maxima:

- 360.8 nm
- 418.5 nm
- 536.4 nm

NOTE See also "Declaration of Conformity for HOX2 Filter" on page 189.

When to do the Test

- after recalibration,
- as part of the Operational Qualification/Performance Verification procedure, or
- after flow cell maintenance or repair.

Interpreting the Results

The test is passed successfully when all three wavelengths are within ± 1 nm of the expected value. This indicates the detector is calibrated correctly.

NOTE ChemStation revisions below B.01.xx show a limit of ± 2 nm. It should read ± 1 nm. If the test shows a value greater than ± 1 nm, perform a recalibration.

Running the test with Agilent Lab Advisor

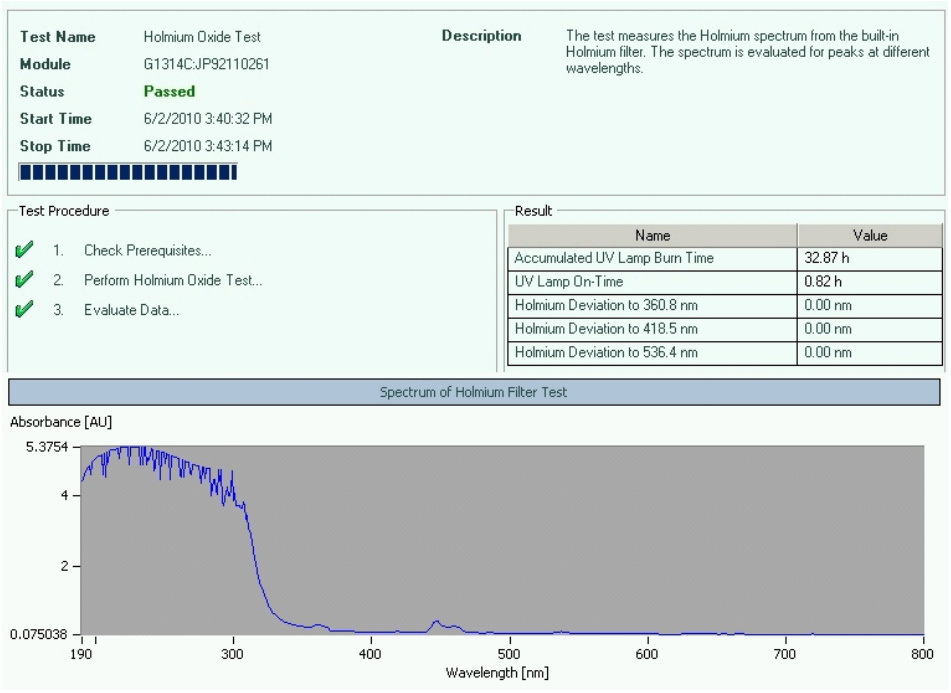


Figure 37 Holmium Test with Agilent Lab Advisor

Holmium Oxide Test Failed

Probable cause	Suggested actions
1 Detector not calibrated.	Recalibrate the detector.
2 Dirty or defective flow cell.	Repeat the test with the flow cell removed. If the test is OK, exchange the flow cell components.
3 Dirty or defective holmium oxide filter.	Run the holmium oxide filter test. If the test fails, contact your Agilent service representative.
4 Optical misalignment.	Please contact your Agilent service representative.

9 Maintenance

Introduction to Maintenance 114
Warnings and Cautions 115
Overview of Maintenance 117
Cleaning the Module 118
Exchanging a Lamp 119
Exchanging a Flow Cell 122
Repairing the Flow Cells 124
Using the Cuvette Holder 126
Correcting Leaks 128
Replacing Leak Handling System Parts 129
Replacing the Interface Board 130
Replacing the Module's Firmware 131

This chapter provides general information on maintenance and repair of the detector.

Introduction to Maintenance

The module is designed for easy maintenance. Maintenance can be done from the front with module in place in the system stack.

NOTE

There are no serviceable parts inside.

Do not open the module.

Warnings and Cautions

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

The handling of solvents, samples and reagents can hold health and safety risks.

➔ When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.

➔ The volume of substances should be reduced to the minimum required for the analysis.

➔ Do not operate the instrument in an explosive atmosphere.

WARNING

Eye damage by detector light

Eye damage may result from directly viewing the UV-light produced by the lamp of the optical system used in this product.

➔ Always turn the lamp of the optical system off before removing it.

WARNING

Electrical shock

Repair work at the module can lead to personal injuries, e.g. shock hazard, when the cover is opened.

➔ Do not remove the cover of the module.

➔ Only certified persons are authorized to carry out repairs inside the module.

WARNING

Personal injury or damage to the product

Agilent is not responsible for any damages caused, in whole or in part, by improper use of the products, unauthorized alterations, adjustments or modifications to the products, failure to comply with procedures in Agilent product user guides, or use of the products in violation of applicable laws, rules or regulations.

➔ Use your Agilent products only in the manner described in the Agilent product user guides.

CAUTION

Safety standards for external equipment

➔ If you connect external equipment to the instrument, make sure that you only use accessory units tested and approved according to the safety standards appropriate for the type of external equipment.

Overview of Maintenance

The following pages describe maintenance (simple repairs) of the detector that can be carried out without opening the main cover.

Table 13 Simple Repairs

Procedures	Typical Frequency	Notes
Deuterium lamp exchange	If noise and/or drift exceeds your application limits or lamp does not ignite.	A VWD test should be performed after replacement.
Flow cell exchange	If application requires a different flow cell type.	A VWD test should be performed after replacement.
Cleaning flow cell parts cleaning or exchange	If leaking or if intensity drops due to contaminated flow cell windows.	A pressure tightness test should be done after repair.
Leak sensor drying	If leak has occurred.	Check for leaks.
Leak handling system replacement	If broken or corroded.	Check for leaks.

Cleaning the Module

To keep the module case clean, use a soft cloth slightly dampened with water, or a solution of water and mild detergent.

WARNING **Liquid dripping into the electronic compartment of your module can cause shock hazard and damage the module**

➔ Do not use an excessively damp cloth during cleaning.

➔ Drain all solvent lines before opening any fittings.

Exchanging a Lamp

When If noise or drift exceeds application limits or lamp does not ignite

Tools required

Description
Screwdriver, Pozidriv #1 PT3

Parts required

p/n	Description
G1314-60100	Deuterium lamp

Preparations Turn the lamp OFF.

WARNING

Injury by touching hot lamp

If the detector has been in use, the lamp may be hot.

➔ If so, wait for lamp to cool down.

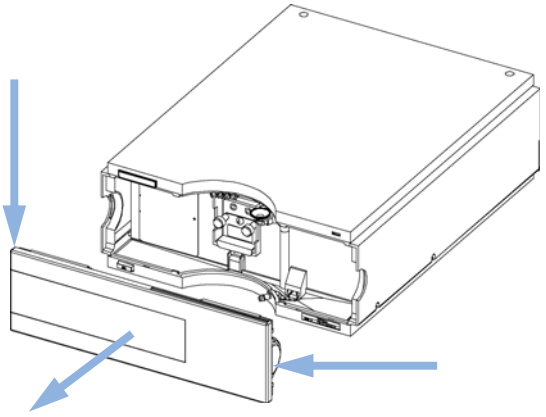
NOTE

If you want to use the Agilent DAD lamp instead of the VWD lamp, you have to change the lamp settings in the VWD Configuration to lamp type 2140-0590. This ensures that the DAD lamp's filament heating is operated like in the DAD.

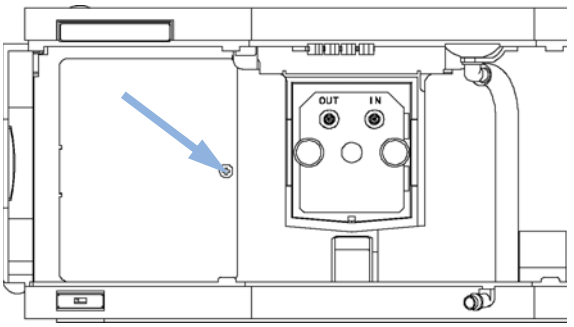
NOTE

The specification are based on Deuterium lamp (p/n G1314-60100) and may be not achieved when other lamp types or aged lamps are used.

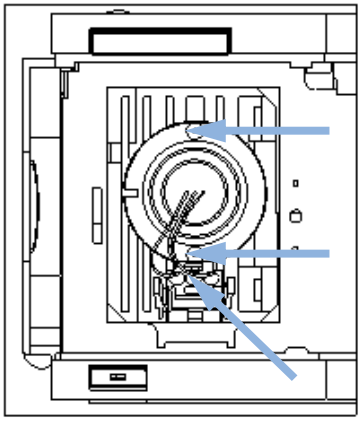
1 Press the release buttons and remove the front cover to have access to the lamp area.



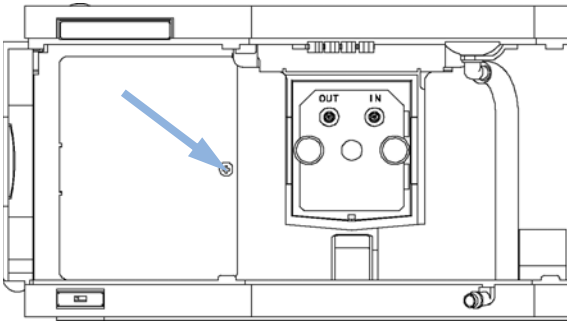
2 Unscrew the lamp cover and remove it.



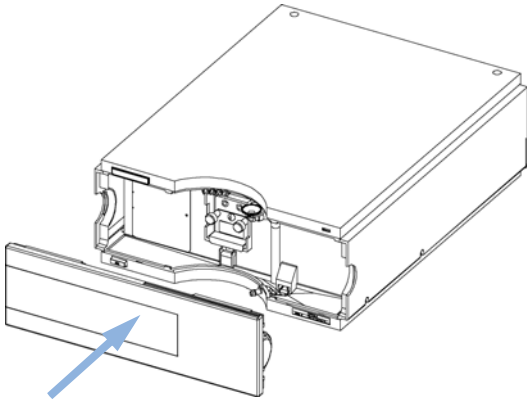
3 Unscrew, disconnect and replace the lamp. Insert, fix and reconnect the lamp.



4 Replace the lamp cover.



5 Replace the front cover.



Next Steps:

6 Reset the lamp counter as described in the User Interface documentation.

7 Turn the lamp ON.

8 Give the lamp more than 10 min to warm-up.

9 Perform "Wavelength Verification-Calibration" on page 104 to check the correct positioning of the lamp.

Exchanging a Flow Cell

When If an application needs a different type of flow cell or the flow cell needs repair.

Tools required

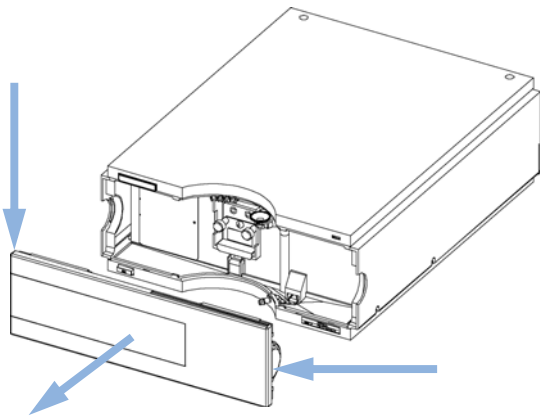
Description
Wrench, 1/4 inch

Parts required

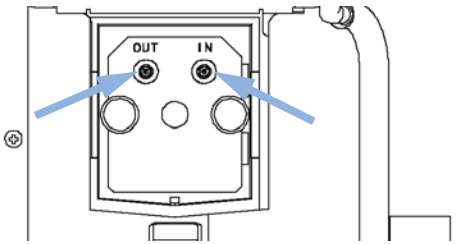
	#	p/n	Description
	1	G1314-60086	Standard flow cell, 10 mm, 14 µL, 40 bar
OR	1	G1314-60081	Micro flow cell, 5 mm, 1 µL, 40 bar
OR	1	G1314-60083	Semi-micro flow cell, 6 mm, 5 µL, 40 bar
OR	1	G1314-60082	High pressure flow cell, 10 mm, 14 µL, 400 bar

Preparations Turn the lamp OFF.

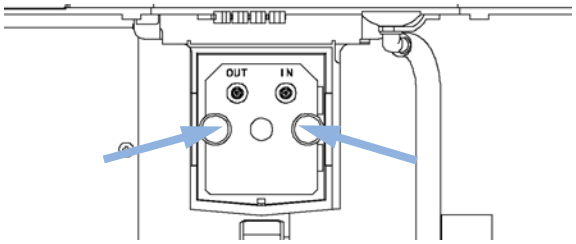
1 Press the release buttons and remove the front cover to have access to the lamp area.



2 Disconnect the inlet and outlet capillaries.



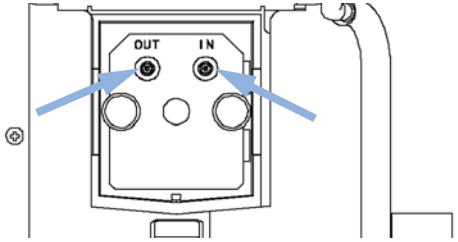
3 Unscrew the thumb screws parallel and remove the flow cell.



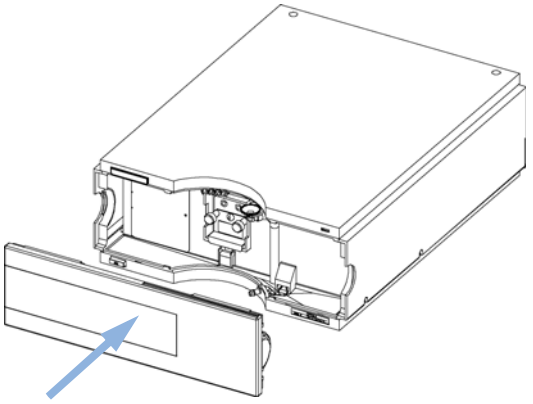
NOTE

If you want to maintain flow cell parts, see "Repairing the Flow Cells" on page 124or the information provided with your flow cell.

4 Press the flow cell completely into the slot and tighten the cell screws (both parallel) until the mechanical stop. Reconnect the inlet and outlet capillaries to the flow cell.



5 Replace the front cover.



Next Steps:

6 To check for leaks, establish a flow and observe the flow cell (outside of the cell compartment) and all capillary connections.

7 Insert the flow cell.

8 Perform "Wavelength Verification-Calibration" on page 104 to check the correct positioning of the flow cell.

9 Replace the front cover.

Repairing the Flow Cells

When If the flow cell needs repair due to leaks or contaminations.

Tools required

Description
Wrench, 1/4 inch
Wrench, 4 mm hexagonal
Toothpick

Parts required

Description
See "Standard Flow Cell 10 mm / 14 µL" on page 135
See "Micro Flow Cell, 5 mm / 1 µL (only for support)" on page 136
See "Semi-micro Flow Cell 6 mm / 5 µL" on page 140
See "High Pressure Flow Cell 10 mm / 14 µL" on page 141

Preparations

- Turn off the flow.
- Remove the front cover.
- Remove the flow cell, see "Exchanging a Flow Cell" on page 122.

NOTE The shown cell parts will differ depending upon the flow cell type. For detailed parts schematics, refer to above mentioned pages.

Disassembling the Flow Cell

1 Unscrew the cell screw using a 4-mm hexagonal wrench.

2 Remove the SST rings using a pair of tweezers.

CAUTION Scratched window surfaces by tweezers

Window surfaces can easily be scratched by using tweezers for removing the windows.

➔ Do not use tweezers to remove windows

3 Use adhesive tape to remove the peek ring, the window and the gasket.

4 Repeat step 1 through step 3 for the other window (keep the parts separate - otherwise they could be mixed!).

Cleaning the Flow Cell Parts

1 Pour isopropanol into the cell hole and wipe clean with a piece of lint-free cloth.

2 Clean the windows with ethanol or methanol. Dry it with a piece of lint-free cloth.

NOTE Always use new gaskets.

Reassembling the Flow Cell

1 Hold the flow cell cassette horizontally and place gasket in position. Ensure both cell holes can be seen through the holes of gasket.

NOTE The semi-micro #1 and #2 gaskets (items 6 and 7, "Semi-micro Flow Cell 6 mm / 5 µL" on page 140) look very similar. Do not mix them up.

2 Place the window on gasket.

3 Place the peek ring on the window.

4 Insert the conical springs. Make sure the conical springs point towards the window. Otherwise tightening the cell screw might break the window.

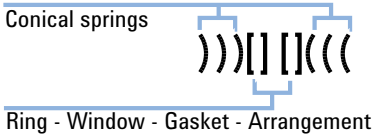


Figure 38 Orientation of conical springs

5 Screw the cell screw into the flow cell and tighten the screw.

6 Repeat the procedure for the other cell side.

Next steps

1 Reconnect the capillaries.

2 Perform a leak test. If OK, insert the flow cell.

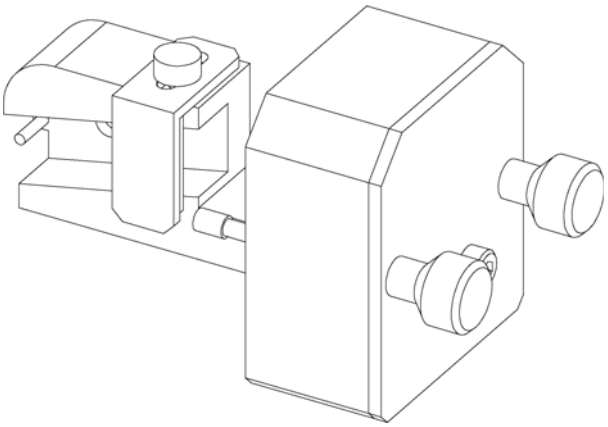
3 Perform "Wavelength Verification-Calibration" on page 104 to check the correct positioning of the flow cell.

4 Replace the front cover.

Using the Cuvette Holder

This cuvette holder can be placed instead of a flow cell in the variable wavelength detector. Standard cuvettes with standards in it, for example, National Institute of Standards & Technology (NIST) holmium oxide solution standard, can be fixed in it.

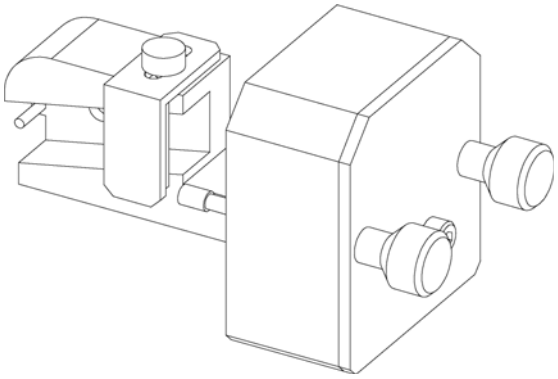
This can be used for wavelength verifications.



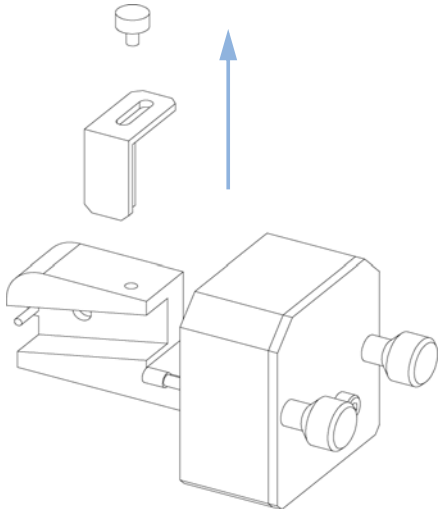
Parts required

#	p/n	Description
1	G1314-60200	Cuvette Holder
1		Cuvette with the “standard”, e.g. NIST certified holmium oxide sample

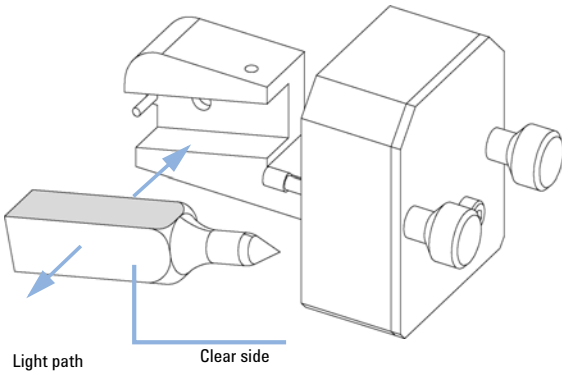
1 Locate the cuvette holder on the desk.



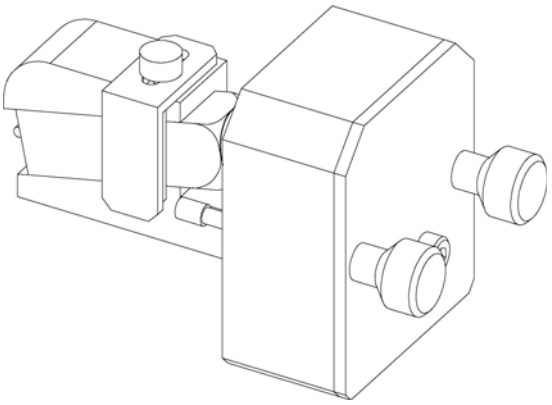
2 Unscrew the bracket.



3 Insert the cuvette with the sample into the holder. The clear side of the cuvette must be visible.



4 Replace the bracket and fix the cuvette.



Next Steps:

5 Install the cuvette holder in the instrument.

6 Perform your Wavelength Verification/Calibration (see "Wavelength Verification-Calibration" on page 104) to check the correct position of the cuvette holder.

Correcting Leaks

When If a leakage has occurred in the flow cell area or at the capillary connections.

Tools required

Description
Tissue
Wrench, 1/4 inch

1. Remove the front cover.
2. Use tissue to dry the leak sensor area.
3. Observe the capillary connections and the flow cell area for leaks and correct, if required.
4. Replace the front cover.

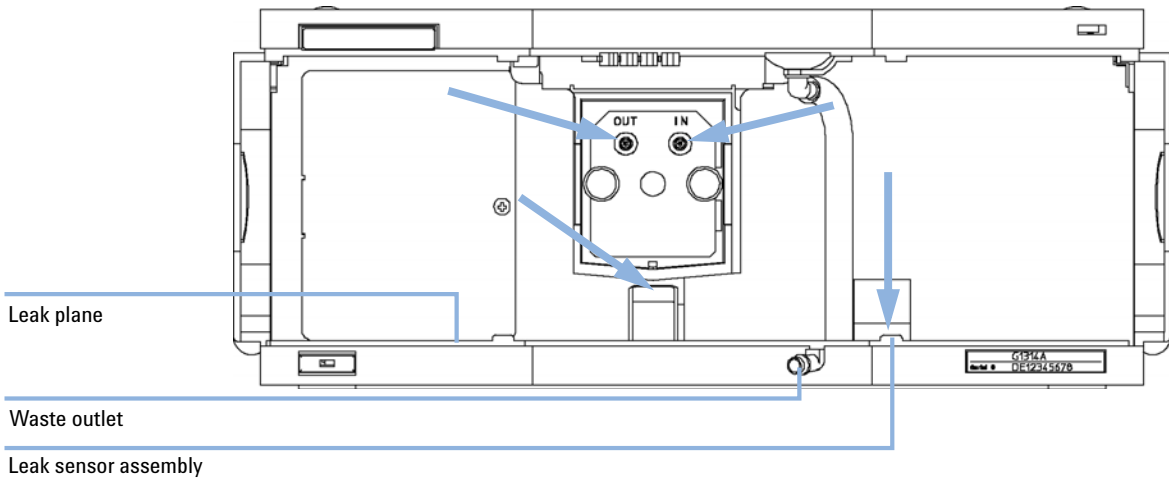


Figure 39 Drying the Leak Sensor

Replacing Leak Handling System Parts

When If the parts are corroded or broken.

Tools required None

Parts required

#	p/n	Description
1	5041-8389	Leak funnel holder
1	5061-3356	Leak funnel
1	5062-2463	Corrugated tubing, PP, 6.5 mm id, 5 m

1 Remove the front cover to have access to the leak handling system.
2 Pull the leak funnel out of the leak funnel holder.
3 Pull the leak funnel with the tubing out of its location.
4 Replace the leak funnel and/or the tubing.
5 Insert the leak funnel with the tubing in its position.
6 Insert the leak funnel into the leak funnel holder.
7 Replace the front cover.

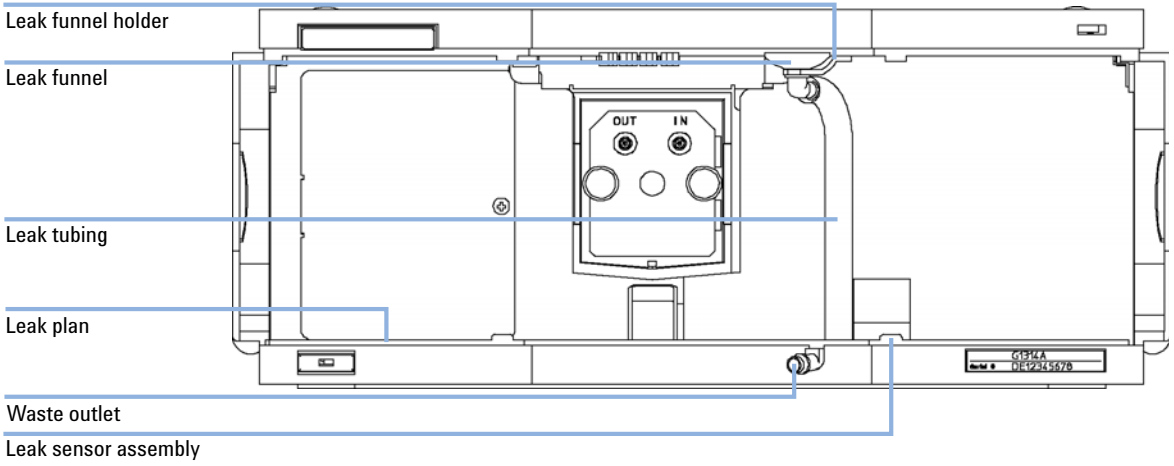


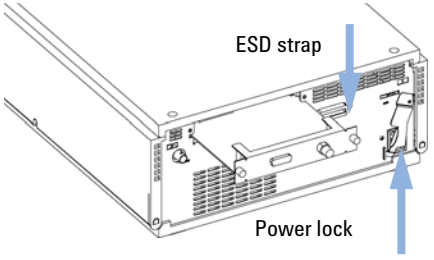
Figure 40 Replacing Waste Handling System Parts

Replacing the Interface Board

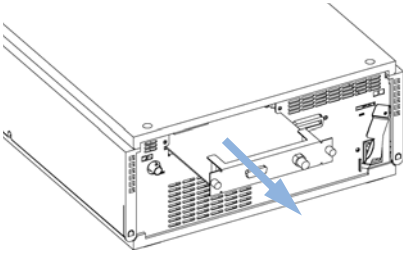
When When defective or for installation of the board or for all repairs inside the detector.

Parts required	**#**	**p/n**	**Description**
	1	G1351-68701	Interface board (BCD) with external contacts and BCD outputs
OR	1	G1369B or G1369-60002	Interface board (LAN)
OR	1	G1369C or G1369-60012	Interface board (LAN)

1 Install the ESD strap. Move the power lock across the power inlet.



2 If required, unscrew and remove the interface board. Place the board on the ESD kit.



Next Steps:

3 If required, insert the interface board and fix the screws.

4 Remove the ESD strap.

5 Reinstall the module into the stack.

Replacing the Module's Firmware

When

The installation of newer firmware might be necessary
- if a newer version solves problems of older versions or
- to keep all systems on the same (validated) revision.

The installation of older firmware might be necessary
- to keep all systems on the same (validated) revision or
- if a new module with newer firmware is added to a system or
- if third part control software requires a special version.

Tools required

	Description
	LAN/RS-232 Firmware Update Tool
OR	Agilent Diagnostic Software
OR	Instant Pilot G4208A

Parts required

#	**Description**
1	Firmware, tools and documentation from Agilent web site

Preparations

Read update documentation provided with the Firmware Update Tool.

To upgrade/downgrade the module's firmware carry out the following steps:

1 Download the required module firmware, the latest LAN/RS-232 FW Update Tool and the documentation from the Agilent web.
   - http://www.chem.agilent.com/scripts/cag_firmware.asp.

2 For loading the firmware into the module follow the instructions in the documentation.

Module Specific Information

Table 14 Module Specific Information (G1314B/C)

	G1314B VWD	G1314C VWD SL
Initial firmware	A.06.02	A.06.02
Compatibility with 1100 / 1200 series modules	yes, all modules should have the firmware from the same set.	
Conversion to / emulation of G1314A or G1314B	possible, if required	

10
Parts and Materials for Maintenance

Overview of Maintenance Parts 134
Standard Flow Cell 10 mm / 14 µL 135
Micro Flow Cell, 5 mm / 1 µL (only for support) 136
Micro Flow Cell 3 mm / 2 µL 138
Semi-micro Flow Cell 6 mm / 5 µL 140
High Pressure Flow Cell 10 mm / 14 µL 141
Cuvette Holder 142
Leak Parts 143
Kits 144

This chapter provides information on parts for maintenance.

Overview of Maintenance Parts

p/n	Description
5181-1516	CAN cable, Agilent module to module, 0.5 m
5181-1519	CAN cable, Agilent module to module, 1 m
G1351-68701	Interface board (BCD) with external contacts and BCD outputs
G1369C or G1369-60012	Interface board (LAN)
G4208-67001	Instant Pilot G4208A (requires firmware B.02.08 or above)
G1314-60100	Deuterium lamp
G1314-60086	Standard flow cell, 10 mm, 14 µL, 40 bar
G1314-60081	Micro flow cell, 5 mm, 1 µL, 40 bar
G1314-60082	High pressure flow cell, 10 mm, 14 µL, 400 bar
G1314-60083	Semi-micro flow cell, 6 mm, 5 µL, 40 bar
G1314-60200	Cuvette Holder
5067-4691	Front Cover
	Leak handling parts

For leak handling parts, see “Leak Parts” on page 143.

Standard Flow Cell 10 mm / 14 µL

Item	p/n	Description
	G1314-60086	Standard flow cell, 10 mm, 14 µL, 40 bar
	5062-8522	Capillary column - detector PEEK 600 mm lg, 0.17 mm i.d., 1/16 inch o.d.
	G1314-65061	Cell Repair Kit, includes 2x Gasket #1, 2x Gasket #2, 2x Window Quartz
1	G1314-65062	Cell screw kit
2	79853-29100	Conical spring kit, 10/pk
3	G1314-65066	Ring #2 kit (IN small hole, i.d. 1 mm) PEEK, 2/pk
4	G1314-65064	Gaskets #2 IN (small hole i.d. 1 mm), KAPTON 10/pk
5	79853-68742	Window quartz kit, 2/pk
6	G1314-65063	Gasket #1 kit (OUT large hole, i.d. 2.4 mm) KAPTON, 2/pk
7	G1314-65065	Ring #1 kit (OUT large hole, i.d. 2.4 mm) PEEK, 2/pk

1 Cell screw

2 Conical springs

3 Ring #2 IN

4 Gasket #2 IN

5 Quartz window

6 Gasket #1 OUT

7 Ring #1 OUT

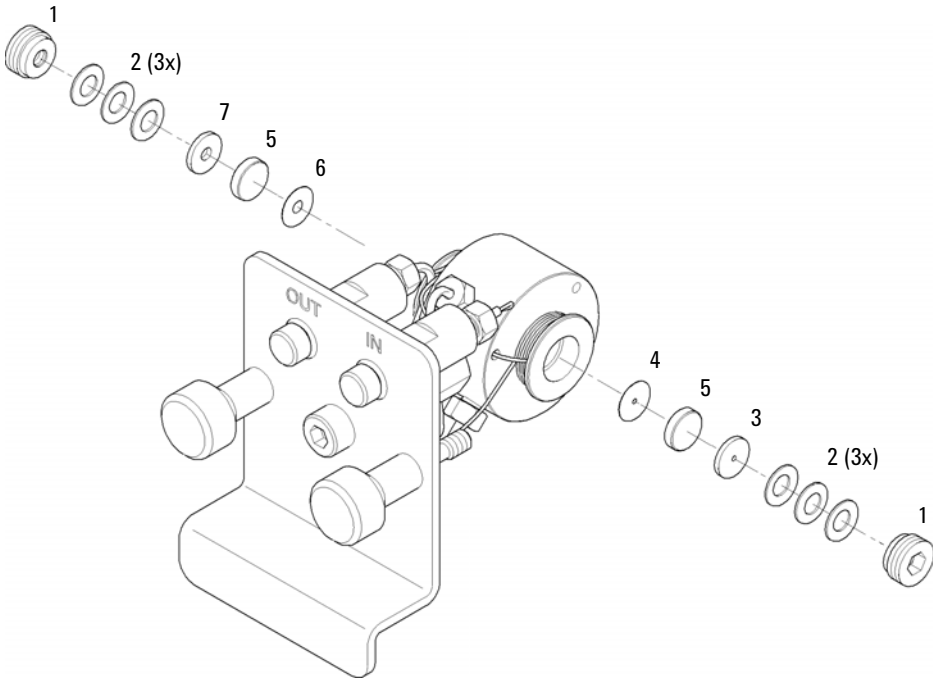


Figure 41 Standard Flow Cell 10 mm / 14 µL

Micro Flow Cell, 5 mm / 1 µL (only for support)

Item	p/n	Description
	G1314-60081	Micro flow cell, 5 mm, 1 µL, 40 bar
	5021-1823	Capillary column – detector SST 400 mm lg, 0.12 mm i.d.
1	G1314-20047	Cell screw
	G1314-65052	Cell kit micro, comprises: two windows, two gaskets #1 and two gaskets #2
2	79853-29100	Conical spring kit, 10/pk
3	79853-22500	Ring SST, 2/pk
5	79853-68742	Window quartz kit, 2/pk
4	79853-68743	PTFE gasket (round hole i.d. 2.5 mm, o.d. 8 mm), (10/pk)
6	G1314-65053	Gasket #2, PTFE, quantity=10

1 - Cell screw
2 - Conical springs
3 - Ring SST
4 - Gasket #1
5 - Window quartz
6 - Gasket #2

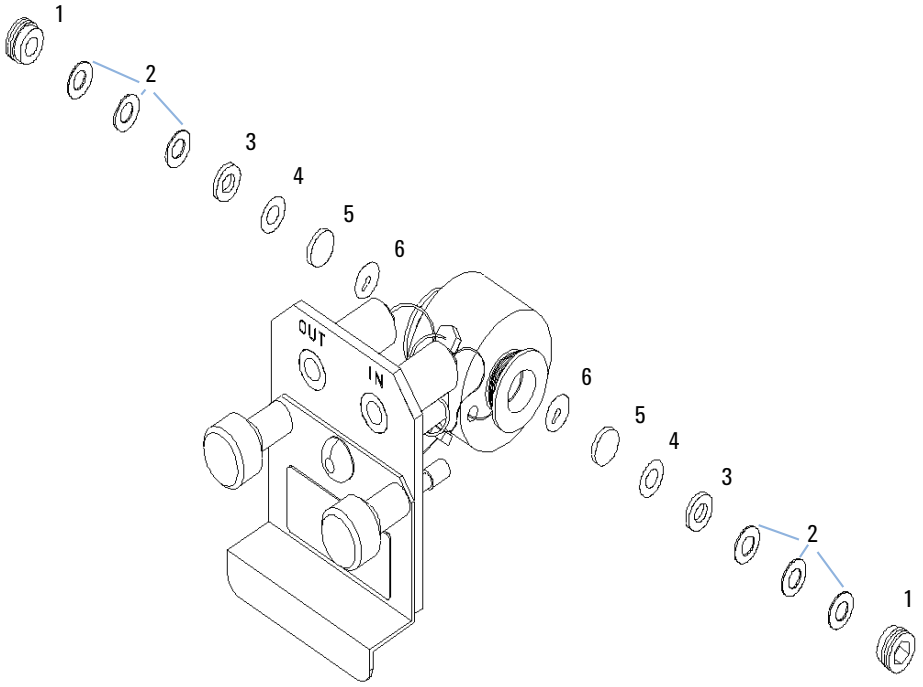


Figure 42 Micro Flow Cell (5 mm, 1 µL, 40 bar)

Micro Flow Cell 3 mm / 2 µL

Item	p/n	Description
	G1314-60087	Micro flow cell, without I.D. tag, 3 mm, 2 µL, 120 bar
	5021-1823	Capillary column – detector SST 400 mm lg, 0.12 mm i.d.
1	79883-22402	Window screw
2	5062-8553	Washer kit (10/pk)
3	79883-28801	Compression washer
4	79883-22301	Window holder
5	1000-0488	Quartz window
6	G1315-68710	Gasket FRONT (PTFE), 1.3 mm hole, inlet side (12/pk)
7	79883-68702	Gasket BACK (PTFE), 1.8 mm hole, outlet side (12/pk)
	G1314-87301	Capillary IN (0.12 mm, 310 mm lg)
	G1314-87302	Capillary OUT (0.17 mm, 120 mm lg)
	G1315-68713	Cell repair kit semi-micro, includes window screw kit, Gasket Kit BACK, Gasket Kit FRONT and 4 mm hexagonal wrench
	79883-68703	Window screw kit, includes 2 quartz windows, 2 compression washers, 2 window holders, 2 window screws and 10 washers

1 Window screw

2 Washers

3 Compression washer

4 Window holder

5 Quartz window

6 Gasket front

7 Gasket back

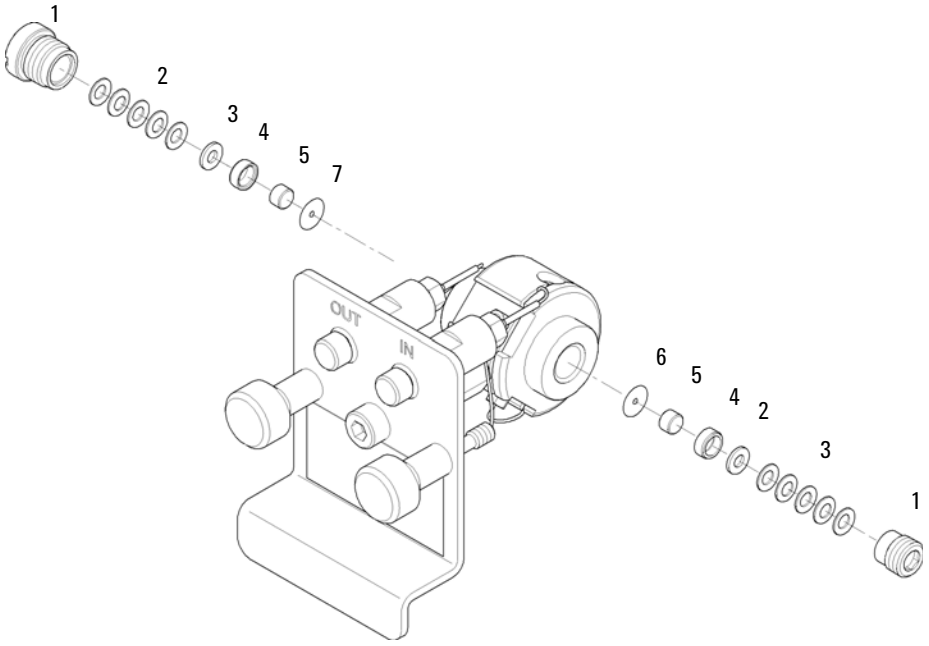


Figure 43 Micro Flow Cell 3 mm / 2 µL

Semi-micro Flow Cell 6 mm / 5 µL

Item	p/n	Description
	G1314-60083	Semi-micro flow cell, 6 mm, 5 µL, 40 bar
	5021-1823	Capillary column – detector SST 400 mm lg, 0.12 mm i.d.
1	G1314-20047	Cell screw
	G1314-65056	Semi-micro cell kit, includes two quartz windows, one gasket #1, one #2 and two PTFE gaskets.
2	79853-29100	Conical spring kit, 10/pk
3	79853-22500	Ring SST, 2/pk
4	79853-68743	PTFE gasket (round hole i.d. 2.5 mm, o.d. 8 mm), (10/pk)
5	79853-68742	Window quartz kit, 2/pk
6		Semi-micro #1 gasket (long hole 1.5 x 3.5 mm), PTFE
7		Semi-micro #2 gasket (long hole 2 x 4 mm), PTFE

1 - Cell screw

2 - Conical springs

3 - Ring SST

4 - PTFE gasket

5 - Quartz window

6 - Semi-micro gasket #1

7 - Semi-micro gasket #2

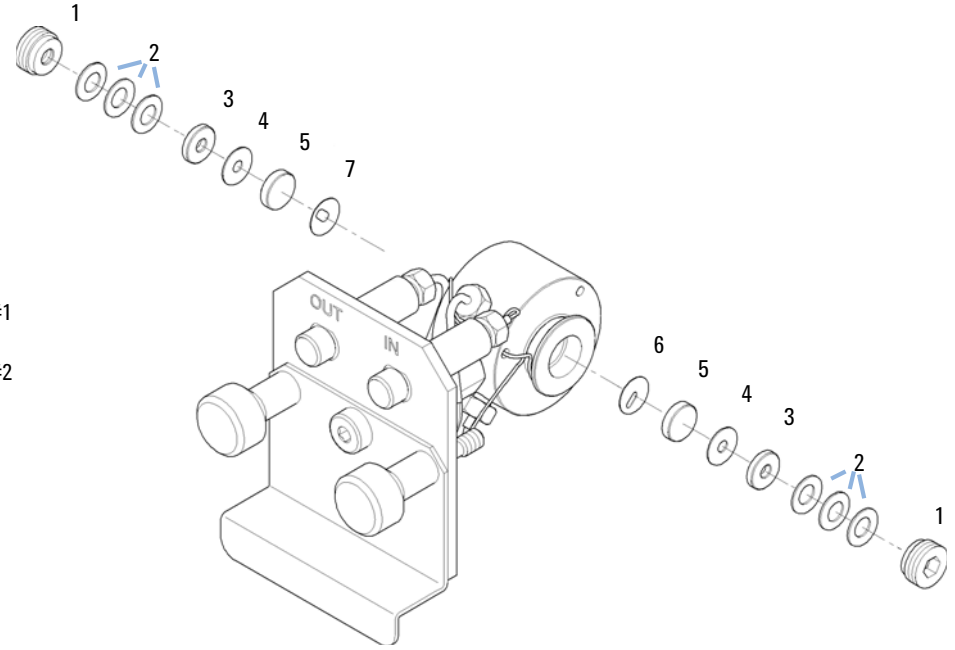


Figure 44 Semi-micro Flow Cell 6 mm / 5 µL

High Pressure Flow Cell 10 mm / 14 µL

Item	p/n	Description
	G1314-60082	High pressure flow cell, 10 mm, 14 µL, 400 bar
	G1315-87311	Capillary column – detector 380 mm lg, 0.17 i.d., (includes ferrule front 1/16", ferrule back 1/16" and fitting 1/16").
1	G1314-20047	Cell screw
	G1314-65054	Cell kit Agilent, comprises: two windows, two KAPTON gaskets and two PEEK rings
2		Ring PEEK kit
3		Window quartz kit
4		Gasket kit, KAPTON

1 - Cell screw

2 - Ring PEEK

3 - Quartz window

4 - Gasket KAPTON

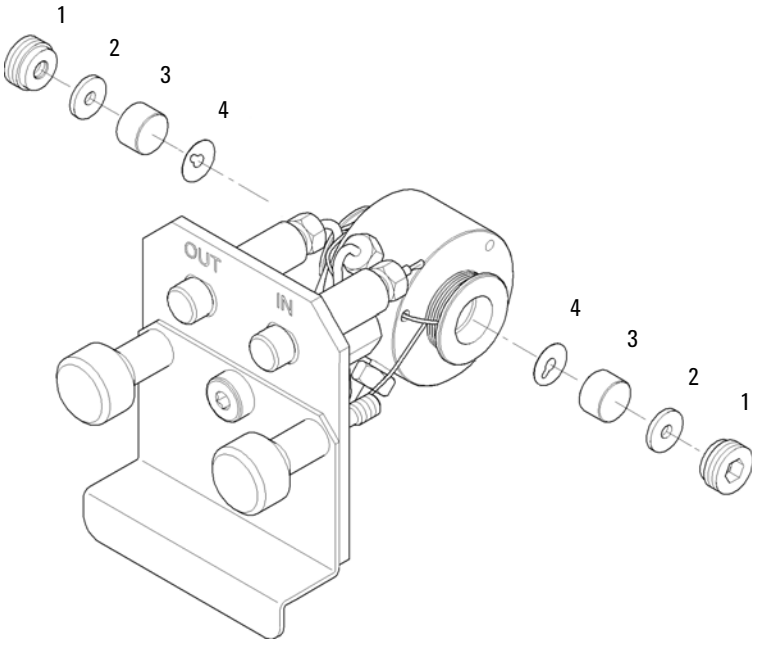


Figure 45 High Pressure Flow Cell 10 mm / 14 µL

Cuvette Holder

For information the use of the cuvette holder, refer to “Using the Cuvette Holder” on page 126.

p/n	Description
G1314-60200	Cuvette Holder

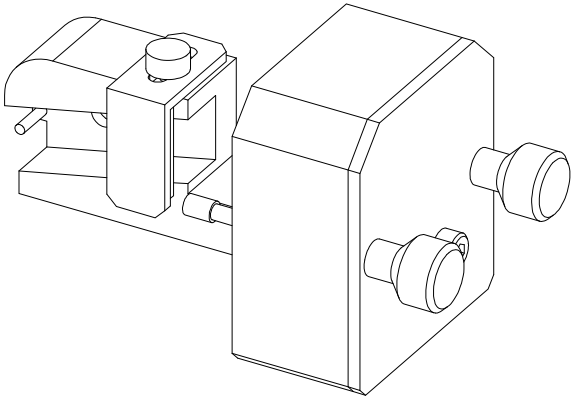


Figure 46 Cuvette Holder

Leak Parts

Item	p/n	Description
3	5041-8388	Leak funnel
4	5041-8389	Leak funnel holder
5	5041-8387	Tube clip
6	5062-2463	Corrugated tubing, PP, 6.5 mm id, 5 m
7	5062-2463	Corrugated tubing, PP, 6.5 mm id, 5 m

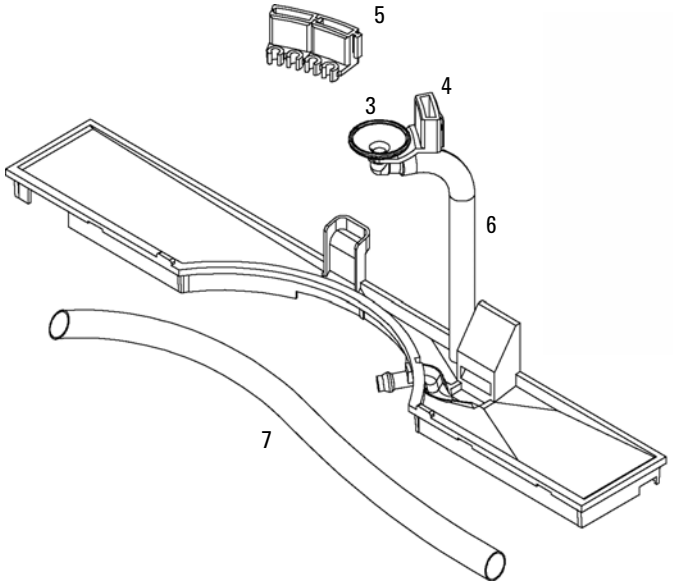


Figure 47 Leak Parts

Kits

HPLC System Tool Kit

HPLC System Tool Kit (p/n G4203-68708) contains some accessories and tools needed for installation and maintenance of the module.

Accessory Kit

Accessory kit (p/n G1314-68755) contains some accessories and tools needed for installation and repair of the module.

p/n	Description
0100-1516	Fitting male PEEK, 2/pk
5062-8535	Waste accessory kit, PEEK capillary 0.25 mm i.d., 1/16 o.d., 500 mm long plus 2 MT PTFE tubing i.d. 0.8 m, 1/16 o.d.
5063-6527	Tubing assembly, i.d. 6 mm, o.d. 9 mm, 1.2 m (to waste)
5181-1516	CAN cable, Agilent module to module, 0.5 m

11
Identifying Cables

Cable Overview 146
Analog Cables 148
Remote Cables 150
BCD Cables 153
CAN/LAN Cables 155
RS-232 Cable Kit 156
External Contact Cable 157

This chapter provides information on cables used with the Agilent 1260 Infinity modules.

Cable Overview

NOTE Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

Analog cables

p/n	Description
35900-60750	Agilent module to 3394/6 integrators
35900-60750	Agilent 35900A A/D converter
01046-60105	Analog cable (BNC to general purpose, spade lugs)

Remote cables

p/n	Description
03394-60600	Agilent module to 3396A Series I integrators
	3396 Series II / 3395A integrator, see details in section "Remote Cables" on page 150
03396-61010	Agilent module to 3396 Series III / 3395B integrators
5061-3378	Agilent module to Agilent 35900 A/D converters (or HP 1050/1046A/1049A)
01046-60201	Agilent module to general purpose

BCD cables

p/n	Description
03396-60560	Agilent module to 3396 integrators
G1351-81600	Agilent module to general purpose

CAN cables

p/n	Description
5181-1516	CAN cable, Agilent module to module, 0.5 m
5181-1519	CAN cable, Agilent module to module, 1 m

LAN cables

p/n	Description
5023-0203	Cross-over network cable, shielded, 3 m (for point to point connection)
5023-0202	Twisted pair network cable, shielded, 7 m (for point to point connection)

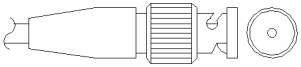
External Contact Cable

p/n	Description
G1103-61611	External contact cable - Agilent module interface board to general purposes

RS-232 cables

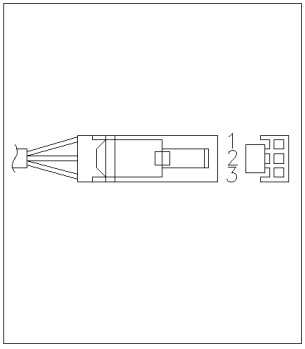
p/n	Description
G1530-60600	RS-232 cable, 2 m
RS232-61600	RS-232 cable, 2.5 m Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It's also called "Null Modem Cable" with full handshaking where the wiring is made between pins 1-1, 2-3, 3-2, 4-6, 5-5, 6-4, 7-8, 8-7, 9-9.
5181-1561	RS-232 cable, 8 m

Analog Cables

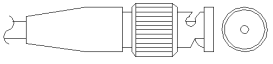


One end of these cables provides a BNC connector to be connected to Agilent modules. The other end depends on the instrument to which connection is being made.

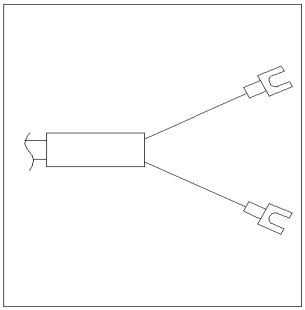
Agilent Module to 3394/6 Integrators

p/n 35900-60750	Pin 3394/6	Pin Agilent module	Signal Name
	1		Not connected
	2	Shield	Analog -
	3	Center	Analog +

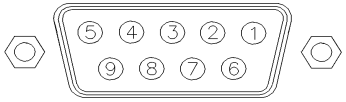
Agilent Module to BNC Connector

p/n 8120-1840	Pin BNC	Pin Agilent module	Signal Name
	Shield	Shield	Analog -
	Center	Center	Analog +

Agilent Module to General Purpose

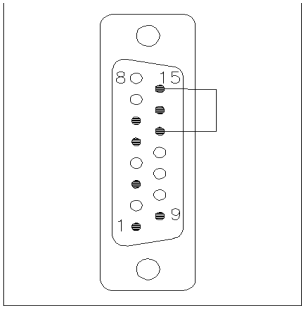
p/n 01046-60105	Pin	Pin Agilent module	Signal Name
	1		Not connected
	2	Black	Analog -
	3	Red	Analog +

Remote Cables



One end of these cables provides a Agilent Technologies APG (Analytical Products Group) remote connector to be connected to Agilent modules. The other end depends on the instrument to be connected to.

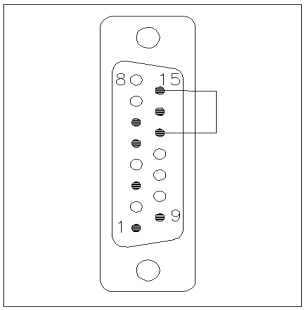
Agilent Module to 3396A Integrators

p/n 03394-60600	Pin 3396A	Pin Agilent module	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	5,14	7 - Red	Ready	High
	1	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low
	13, 15		Not connected	

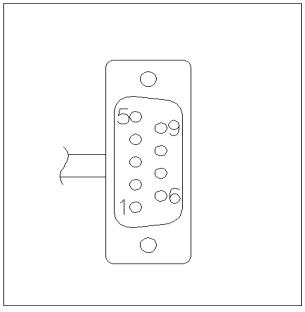
Agilent Module to 3396 Series II / 3395A Integrators

Use the cable Agilent module to 3396A Series I integrators (p/n 03394-60600) and cut pin #5 on the integrator side. Otherwise the integrator prints START; not ready.

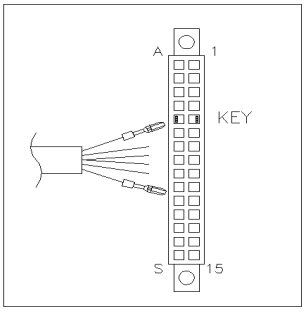
Agilent Module to 3396 Series III / 3395B Integrators

p/n 03396-61010	Pin 33XX	Pin Agilent module	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	14	7 - Red	Ready	High
	4	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low
	13, 15		Not connected	

Agilent Module to Agilent 35900 A/D Converters

p/n 5061-3378	Pin 35900 A/D	Pin Agilent module	Signal Name	Active (TTL)
	1 - White	1 - White	Digital ground	
	2 - Brown	2 - Brown	Prepare run	Low
	3 - Gray	3 - Gray	Start	Low
	4 - Blue	4 - Blue	Shut down	Low
	5 - Pink	5 - Pink	Not connected	
	6 - Yellow	6 - Yellow	Power on	High
	7 - Red	7 - Red	Ready	High
	8 - Green	8 - Green	Stop	Low
	9 - Black	9 - Black	Start request	Low

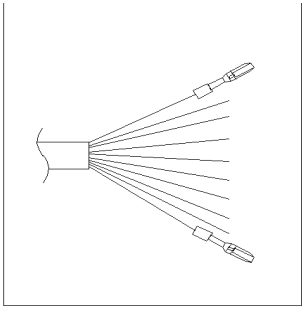
Agilent Module to General Purpose

p/n 01046-60201	Wire Color	Pin Agilent module	Signal Name	Active (TTL)
	White	1	Digital ground	
	Brown	2	Prepare run	Low
	Gray	3	Start	Low
	Blue	4	Shut down	Low
	Pink	5	Not connected	
	Yellow	6	Power on	High
	Red	7	Ready	High
	Green	8	Stop	Low
	Black	9	Start request	Low

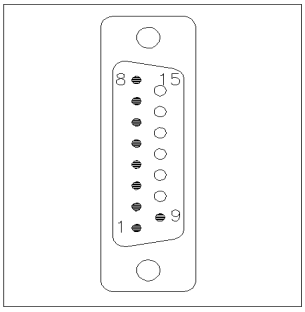
BCD Cables

One end of these cables provides a 15-pin BCD connector to be connected to the Agilent modules. The other end depends on the instrument to be connected to

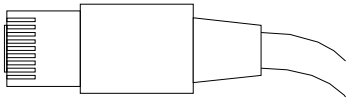
Agilent Module to General Purpose

p/n G1351-81600	Wire Color	Pin Agilent module	Signal Name	BCD Digit
	Green	1	BCD 5	20
	Violet	2	BCD 7	80
	Blue	3	BCD 6	40
	Yellow	4	BCD 4	10
	Black	5	BCD 0	1
	Orange	6	BCD 3	8
	Red	7	BCD 2	4
	Brown	8	BCD 1	2
	Gray	9	Digital ground	Gray
	Gray/pink	10	BCD 11	800
	Red/blue	11	BCD 10	400
	White/green	12	BCD 9	200
	Brown/green	13	BCD 8	100
	not connected	14		
	not connected	15	+ 5 V	Low

Agilent Module to 3396 Integrators

p/n 03396-60560	Pin 3396	Pin Agilent module	Signal Name	BCD Digit
	1	1	BCD 5	20
	2	2	BCD 7	80
	3	3	BCD 6	40
	4	4	BCD 4	10
	5	5	BCD0	1
	6	6	BCD 3	8
	7	7	BCD 2	4
	8	8	BCD 1	2
	9	9	Digital ground	
	NC	15	+ 5 V	Low

CAN/LAN Cables



Both ends of this cable provide a modular plug to be connected to Agilent modules CAN or LAN connectors.

CAN Cables

p/n	Description
5181-1516	CAN cable, Agilent module to module, 0.5 m
5181-1519	CAN cable, Agilent module to module, 1 m

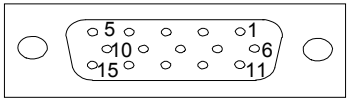
LAN Cables

p/n	Description
5023-0203	Cross-over network cable, shielded, 3 m (for point to point connection)
5023-0202	Twisted pair network cable, shielded, 7 m (for point to point connection)

RS-232 Cable Kit

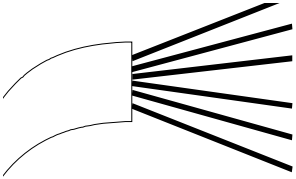
p/n	Description
G1530-60600	RS-232 cable, 2 m
RS232-61600	RS-232 cable, 2.5 m Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It's also called "Null Modem Cable" with full handshaking where the wiring is made between pins 1-1, 2-3, 3-2, 4-6, 5-5, 6-4, 7-8, 8-7, 9-9.
5181-1561	RS-232 cable, 8 m

External Contact Cable



One end of this cable provides a 15-pin plug to be connected to Agilent modules interface board. The other end is for general purpose.

Agilent Module Interface Board to general purposes

p/n G1103-61611	Color	Pin Agilent module	Signal Name
	White	1	EXT 1
	Brown	2	EXT 1
	Green	3	EXT 2
	Yellow	4	EXT 2
	Grey	5	EXT 3
	Pink	6	EXT 3
	Blue	7	EXT 4
	Red	8	EXT 4
	Black	9	Not connected
	Violet	10	Not connected
	Grey/pink	11	Not connected
	Red/blue	12	Not connected
	White/green	13	Not connected
	Brown/green	14	Not connected
	White/yellow	15	Not connected

12
Hardware Information

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This chapter describes the detector in more detail on hardware and electronics.

Firmware Description

The firmware of the instrument consists of two independent sections:

- a non-instrument specific section, called *resident system*
- an instrument specific section, called *main system*

Resident System

This resident section of the firmware is identical for all Agilent 1100/1200/1220/1260/1290 series modules. Its properties are:

- the complete communication capabilities (CAN, LAN and RS-232C)
- memory management
- ability to update the firmware of the 'main system'

Main System

Its properties are:

- the complete communication capabilities (CAN, LAN and RS-232C)
- memory management
- ability to update the firmware of the 'resident system'

In addition the main system comprises the instrument functions that are divided into common functions like

- run synchronization through APG remote,
- error handling,
- diagnostic functions,
- or module specific functions like
  - internal events such as lamp control, filter movements,
  - raw data collection and conversion to absorbance.

Firmware Updates

Firmware updates can be done using your user interface:

- PC and Firmware Update Tool with local files on the hard disk

- Instant Pilot (G4208A) with files from a USB Flash Disk
- Agilent Lab Advisor software B.01.03 and above

The file naming conventions are:

PPPP_RVVV_XXX.dlb, where

PPPP is the product number, for example, 1315AB for the G1315A/B DAD,

R the firmware revision, for example, A for G1315B or B for the G1315C DAD,

VVV is the revision number, for example 102 is revision 1.02,

XXX is the build number of the firmware.

For instructions on firmware updates refer to section *Replacing Firmware* in chapter *"Maintenance"* or use the documentation provided with the *Firmware Update Tools*.

NOTE

Update of main system can be done in the resident system only. Update of the resident system can be done in the main system only.

Main and resident firmware must be from the same set.

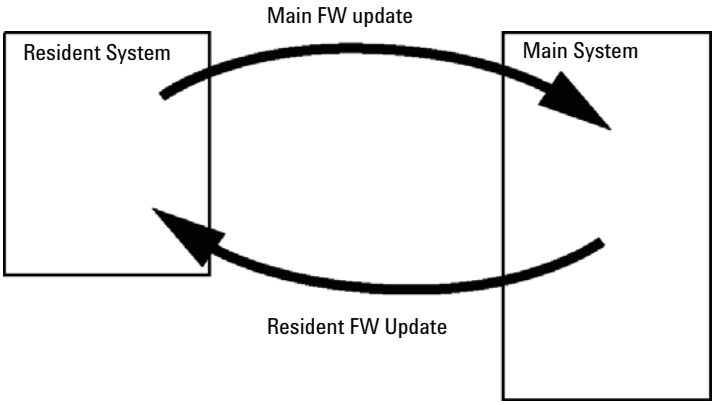


Figure 48 Firmware Update Mechanism

NOTE

Some modules are limited in downgrading due to their main board version or their initial firmware revision. For example, a G1315C DAD SL cannot be downgraded below firmware revision B.01.02 or to a A.xx.xx.

Some modules can be re-branded (e.g. G1314C to G1314B) to allow operation in specific control software environments. In this case the feature set of the target type are use and the feature set of the original are lost. After re-branding (e.g. from G1314B to G1314C), the original feature set is available again.

All these specific informations are described in the documentation provided with the firmware update tools.

The firmware update tools, firmware and documentation are available from the Agilent web.

- http://www.chem.agilent.com/EN-US/SUPPORT/DOWNLOADS/FIRMWARE/Pages/LC.aspx

Optional Interface Boards

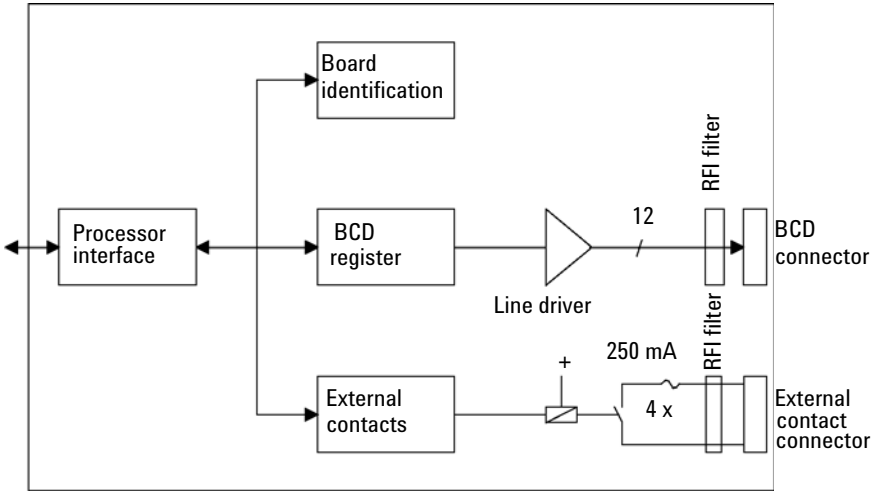
BCD / External Contact Board

The Agilent 1200 Infinity Series modules have one optional board slot that allows to add an interface board to the modules. Some modules do not have this interface slot. Refer to "Interfaces" on page 169 for details.

Optional Interface Boards

p/n	Description
G1351-68701	Interface board (BCD) with external contacts and BCD outputs
2110-0004	Fuse for BCD board, 250 mA

The BCD board provides a BCD output for the bottle number of the Agilent 1200 Series autosampler and four external contacts. The external contact closure contacts are relay contacts. The maximum settings are: 30 V (AC/DC); 250 mA (fused).



There are general purpose cables available to connect the BCD output, see "BCD Cables" on page 153 and the external outputs, see "External Contact Cable" on page 157 to external devices.

Table 15 Detailed connector layout (1200)

Pin	Signal name	BCD digit
1	BCD 5	20
2	BCD 7	80
3	BCD 6	40
4	BCD 4	10
5	BCD 0	1
6	BCD 3	8
7	BCD 2	4
8	BCD 1	2
9	Digital ground	
10	BCD 11	800
11	BCD 10	400
12	BCD 9	200
13	BCD 8	100
15	+5V	Low

LAN Communication Interface Board

The Agilent modules have one optional board slot that allows to add an interface board to the modules. Some modules do not have this interface slot. Refer to "Interfaces" on page 169 for details.

p/n	Description
G1369B or G1369-60002	Interface board (LAN)
G1369C or G1369-60012	Interface board (LAN)

NOTE One board is required per Agilent 1260 Infinity instrument. It is recommended to add the LAN board to the detector with highest data rate.

NOTE For the configuration of the G1369 LAN Communication Interface card refer to its documentation.

The following cards can be used with the Agilent 1260 Infinity modules.

Table 16 LAN Boards

Type	Vendor	Supported networks
Interface board (LAN) (p/n G1369B or G1369-60002) or Interface board (LAN) (p/n G1369C or G1369-60012)	Agilent Technologies	Fast Ethernet, Ethernet/802.3, RJ-45 (10/100Base-TX) *recommended for re-ordering*
LAN Communication Interface board (p/n G1369A or G1369-60001)	Agilent Technologies	Fast Ethernet, Ethernet/802.3, RJ-45 (10/100Base-TX) (*obsolete*)
J4106A[1]	Hewlett Packard	Ethernet/802.3, RJ-45 (10Base-T)
J4105A[1]	Hewlett Packard	Token Ring/802.5, DB9, RJ-45 (10Base-T)
J4100A[1]	Hewlett Packard	Fast Ethernet, Ethernet/802.3, RJ-45 (10/100Base-TX) + BNC (10Base2)

[1] These cards may be no longer orderable. Minimum firmware of these Hewlett Packard JetDirect cards is A.05.05.

Recommended LAN Cables

p/n	Description
5023-0203	Cross-over network cable, shielded, 3 m (for point to point connection)
5023-0202	Twisted pair network cable, shielded, 7 m (for point to point connection)

Electrical Connections

- The CAN bus is a serial bus with high speed data transfer. The two connectors for the CAN bus are used for internal module data transfer and synchronization.
- One analog output provides signals for integrators or data handling systems.
- The interface board slot is used for external contacts and BCD bottle number output or LAN connections.
- The REMOTE connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features such as start, stop, common shut down, prepare, and so on.
- With the appropriate software, the RS-232C connector may be used to control the module from a computer through a RS-232C connection. This connector is activated and can be configured with the configuration switch.
- The power input socket accepts a line voltage of 100 – 240 VAC ± 10 % with a line frequency of 50 or 60 Hz. Maximum power consumption varies by module. There is no voltage selector on your module because the power supply has wide-ranging capability. There are no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

NOTE Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

Serial Number Information (ALL)

Serial Number Information 1260 Infinity

The serial number information on the instrument labels provide the following information:

CCXZZ00000	Format
CC	Country of manufacturing • DE = Germany • JP = Japan • CN = China
X	Alphabetic character A-Z (used by manufacturing)
ZZ	Alpha-numeric code 0-9, A-Z, where each combination unambiguously denotes a module (there can be more than one code for the same module)
00000	Serial number

Serial Number Information 1200 Series and 1290 Infinity

The serial number information on the instrument labels provide the following information:

CCYWWSSSSS	Format
CC	country of manufacturing • DE = Germany • JP = Japan • CN = China
YWW	year and week of last major manufacturing change, e.g. 820 could be week 20 of 1998 or 2008
SSSSS	real serial number

Rear view of the module

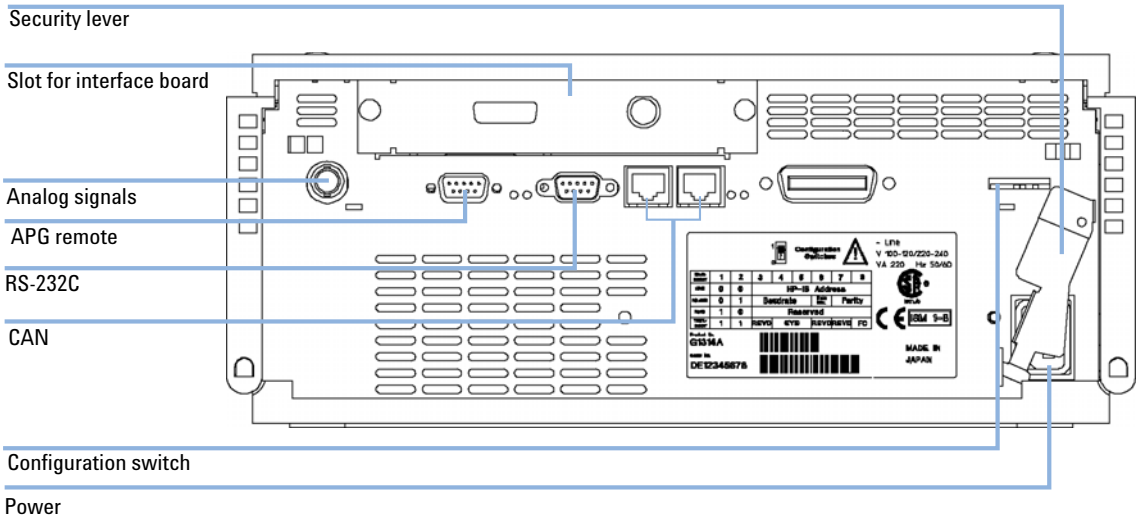


Figure 49 Rear view of detector

NOTE The GPIB interface has been removed with the introduction of the 1260 Infinity modules.

Interfaces

The Agilent 1200 Infinity Series modules provide the following interfaces:

Table 17 Agilent 1200 Infinity Series Interfaces

Module	CAN	LAN/BCD (optional)	LAN (on-board)	RS-232	Analog	APG Remote	Special
Pumps							
G1310B Iso Pump G1311B Quat Pump G1311C Quat Pump VL G1312B Bin Pump G1312C Bin Pump VL 1376A Cap Pump G2226A Nano Pump G5611A Bio-inert Quat Pump	2	Yes	No	Yes	1	Yes	
G4220A/B Bin Pump	2	No	Yes	Yes	No	Yes	
G1361A Prep Pump	2	Yes	No	Yes	No	Yes	CAN-DC- OUT for CAN slaves
Samplers							
G1329B ALS G2260A Prep ALS	2	Yes	No	Yes	No	Yes	THERMOSTAT for G1330B
G1364B FC-PS G1364C FC-AS G1364D FC-µS G1367E HiP ALS G1377A HiP micro ALS G2258A DL ALS G5664A Bio-inert FC-AS G5667A Bio-inert Autosampler	2	Yes	No	Yes	No	Yes	THERMOSTAT for G1330B CAN-DC- OUT for CAN slaves
G4226A ALS	2	Yes	No	Yes	No	Yes	
Detectors							
G1314B VWD VL G1314C VWD VL+	2	Yes	No	Yes	1	Yes	
G1314E/F VWD	2	No	Yes	Yes	1	Yes	
G4212A/B DAD	2	No	Yes	Yes	1	Yes	

Table 17 Agilent 1200 Infinity Series Interfaces

Module	CAN	LAN/BCD (optional)	LAN (on-board)	RS-232	Analog	APG Remote	Special
G1315C DAD VL+ G1365C MWD G1315D DAD VL G1365D MWD VL	2	No	Yes	Yes	2	Yes	
G1321B FLD G1362A RID	2	Yes	No	Yes	1	Yes	
G4280A ELSD	No	No	No	Yes	Yes	Yes	EXT Contact AUTOZERO
Others							
G1170A Valve Drive	2	No	No	No	No	No	Requires a HOST module with on-board LAN (e.g. G4212A or G4220A with minimum firmware B.06.40 or C.06.40) or with additional G1369C LAN Card
G1316A/C TCC	2	No	No	Yes	No	Yes	
G1322A DEG	No	No	No	No	No	Yes	AUX
G1379B DEG	No	No	No	Yes	No	No	AUX
G4227A Flex Cube	2	No	No	No	No	No	
G4240A CHIP CUBE	2	Yes	No	Yes	No	Yes	CAN-DC- OUT for CAN slaves THERMOSTAT for G1330A/B (NOT USED)

NOTE The detector (DAD/MWD/FLD/VWD/RID) is the preferred access point for control via LAN. The inter-module communication is done via CAN.

- CAN connectors as interface to other modules
- LAN connector as interface to the control software
- RS-232C as interface to a computer
- REMOTE connector as interface to other Agilent products
- Analog output connector(s) for signal output

Interfaces Overview

CAN

The CAN is inter-module communication interface. It is a 2-wire serial bus system supporting high speed data communication and real-time requirement.

LAN

The modules have either an interface slot for an LAN card (e.g. Agilent G1369B/C LAN Interface) or they have an on-board LAN interface (e.g. detectors G1315C/D DAD and G1365C/D MWD). This interface allows the control of the module/system via a PC with the appropriate control software.

NOTE If an Agilent detector (DAD/MWD/FLD/VWD/RID) is in the system, the LAN should be connected to the DAD/MWD/FLD/VWD/RID (due to higher data load). If no Agilent detector is part of the system, the LAN interface should be installed in the pump or autosampler.

RS-232C (Serial)

The RS-232C connector is used to control the module from a computer through RS-232C connection, using the appropriate software. This connector can be configured with the configuration switch module at the rear of the module. Refer to *Communication Settings for RS-232C*.

NOTE There is no configuration possible on main boards with on-board LAN. These are pre-configured for

- 19200 baud,
- 8 data bit with no parity and
- one start bit and one stop bit are always used (not selectable).

The RS-232C is designed as DCE (data communication equipment) with a 9-pin male SUB-D type connector. The pins are defined as:

Table 18 RS-232C Connection Table

Pin	Direction	Function
1	In	DCD
2	In	RxD
3	Out	TxD
4	Out	DTR
5		Ground
6	In	DSR
7	Out	RTS
8	In	CTS
9	In	RI

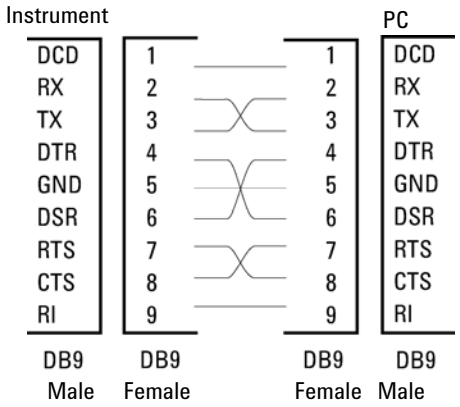


Figure 50 RS-232 Cable

Analog Signal Output

The analog signal output can be distributed to a recording device. For details refer to the description of the module's main board.

APG Remote

The APG Remote connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features as common shut down, prepare, and so on.

Remote control allows easy connection between single instruments or systems to ensure coordinated analysis with simple coupling requirements.

The subminiature D connector is used. The module provides one remote connector which is inputs/outputs (wired- or technique).

To provide maximum safety within a distributed analysis system, one line is dedicated to **SHUT DOWN** the system's critical parts in case any module detects a serious problem. To detect whether all participating modules are switched on or properly powered, one line is defined to summarize the **POWER ON** state of all connected modules. Control of analysis is maintained by signal readiness **READY** for next analysis, followed by **START** of run and optional **STOP** of run triggered on the respective lines. In addition **PREPARE** and **START REQUEST** may be issued. The signal levels are defined as:

- standard TTL levels (0 V is logic true, + 5.0 V is false),
- fan-out is 10 V,
- input load is 2.2 kOhm against + 5.0 V, and
- output are open collector type, inputs/outputs (wired- or technique).

NOTE All common TTL circuits operate with a 5 V power supply. A TTL signal is defined as "low" or L when between 0 V and 0.8 V and "high" or H when between 2.0 V and 5.0 V (with respect to the ground terminal).

Table 19 Remote Signal Distribution

Pin	Signal	Description
1	DGND	Digital ground
2	PREPARE	(L) Request to prepare for analysis (for example, calibration, detector lamp on). Receiver is any module performing pre-analysis activities.
3	START	(L) Request to start run / timetable. Receiver is any module performing run-time controlled activities.
4	SHUT DOWN	(L) System has serious problem (for example, leak: stops pump). Receiver is any module capable to reduce safety risk.
5		Not used
6	POWER ON	(H) All modules connected to system are switched on. Receiver is any module relying on operation of others.
7	READY	(H) System is ready for next analysis. Receiver is any sequence controller.
8	STOP	(L) Request to reach system ready state as soon as possible (for example, stop run, abort or finish and stop injection). Receiver is any module performing run-time controlled activities.
9	START REQUEST	(L) Request to start injection cycle (for example, by start key on any module). Receiver is the autosampler.

Special Interfaces

Some modules have module specific interfaces/connectors. They are described in the module documentation.

Setting the 8-bit Configuration Switch (without On-board) LAN

The 8-bit configuration switch is located at the rear of the module.

This module does not have its own on-board LAN interface. It can be controlled through the LAN interface of another module, and a CAN connection to that module.

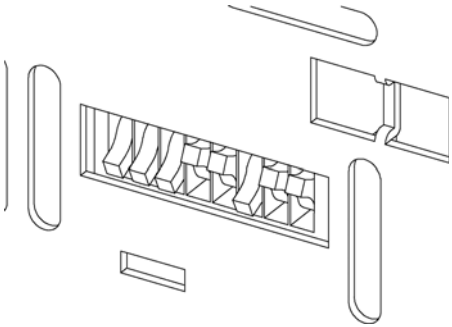


Figure 51 Configuration switch (settings depend on configured mode)

All modules without on-board LAN:

- default should be ALL DIPS DOWN (= best settings)
  - Bootp mode for LAN and
  - 19200 baud, 8 data bit / 1 stop bit with no parity for RS-232
- DIP 1 DOWN and DIP 2 UP allows special RS-232 settings
- for boot/test modes DIPS 1+2 must be UP plus required mode

NOTE For normal operation use the default (best) settings.

Switch settings provide configuration parameters for serial communication protocol and instrument specific initialization procedures.

NOTE With the introduction of the Agilent 1260 Infinity, all GPIB interfaces have been removed. The preferred communication is LAN.

NOTE The following tables represent the configuration switch settings for the modules without on-board LAN only.

Table 20 8-bit Configuration Switch (without on-board LAN)

Mode Select	1	2	3	4	5	6	7	8
RS-232C	0	1	Baudrate			Data Bits	Parity	
Reserved	1	0	Reserved					
TEST/BOOT	1	1	RSVD	SYS		RSVD	RSVD	FC

NOTE The LAN settings are done on the LAN Interface Card G1369B/C. Refer to the documentation provided with the card.

Communication Settings for RS-232C

The communication protocol used in the column compartment supports only hardware handshake (CTS/RTR).

Switches 1 in down and 2 in up position define that the RS-232C parameters will be changed. Once the change has been completed, the column instrument must be powered up again in order to store the values in the non-volatile memory.

Table 21 Communication Settings for RS-232C Communication (without on-board LAN)

Mode Select	1	2	3	4	5	6	7	8
RS-232C	0	1	Baudrate			Data Bits	Parity	

Use the following tables for selecting the setting which you want to use for RS-232C communication. The number 0 means that the switch is down and 1 means that the switch is up.

Table 22 Baudrate Settings (without on-board LAN)

Switches			Baud Rate	Switches			Baud Rate
3	**4**	**5**		**3**	**4**	**5**	
0	0	0	9600	1	0	0	9600
0	0	1	1200	1	0	1	14400
0	1	0	2400	1	1	0	19200
0	1	1	4800	1	1	1	38400

Table 23 Data Bit Settings (without on-board LAN)

Switch 6	Data Word Size
0	7 Bit Communication
1	8 Bit Communication

Table 24 Parity Settings (without on-board LAN)

Switches		Parity
7	8	
0	0	No Parity
0	1	Odd Parity
1	1	Even Parity

One start bit and one stop bit are always used (not selectable).

Per default, the module will turn into 19200 baud, 8 data bit with no parity.

Special Settings

The special settings are required for specific actions (normally in a service case).

Boot-Resident

Firmware update procedures may require this mode in case of firmware loading errors (main firmware part).

If you use the following switch settings and power the instrument up again, the instrument firmware stays in the resident mode. It is not operable as a module. It only uses basic functions of the operating system for example, for communication. In this mode the main firmware can be loaded (using update utilities).

Table 25 Boot Resident Settings (without on-board LAN)

	Mode Select	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
No LAN	TEST/BOOT	1	1	0	0	1	0	0	0

Forced Cold Start

A forced cold start can be used to bring the module into a defined mode with default parameter settings.

CAUTION

Loss of data

Forced cold start erases all methods and data stored in the non-volatile memory. Exceptions are calibration settings, diagnosis and repair log books which will not be erased.

➔ Save your methods and data before executing a forced cold start.

If you use the following switch settings and power the instrument up again, a forced cold start has been completed.

Table 26 Forced Cold Start Settings (without on-board LAN)

	Mode Select	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
No LAN	TEST/BOOT	1	1	0	0	1	0	0	1

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This chapter provides addition information on safety, legal and web.

General Safety Information

General Safety Information

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

WARNING

Ensure the proper usage of the equipment.

The protection provided by the equipment may be impaired.

➔ The operator of this instrument is advised to use the equipment in a manner as specified in this manual.

Safety Standards

This is a Safety Class I instrument (provided with terminal for protective earthing) and has been manufactured and tested according to international safety standards.

Operation

Before applying power, comply with the installation section. Additionally the following must be observed.

Do not remove instrument covers when operating. Before the instrument is switched on, all protective earth terminals, extension cords, auto-transformers, and devices connected to it must be connected to a protective earth via a ground socket. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in serious personal injury. Whenever it is likely that the protection has been impaired,

the instrument must be made inoperative and be secured against any intended operation.

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, and so on) are used for replacement. The use of repaired fuses and the short-circuiting of fuse holders must be avoided.

Some adjustments described in the manual, are made with power supplied to the instrument, and protective covers removed. Energy available at many points may, if contacted, result in personal injury.

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided whenever possible. When inevitable, this has to be carried out by a skilled person who is aware of the hazard involved. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present. Do not replace components with power cable connected.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Do not install substitute parts or make any unauthorized modification to the instrument.

Capacitors inside the instrument may still be charged, even though the instrument has been disconnected from its source of supply. Dangerous voltages, capable of causing serious personal injury, are present in this instrument. Use extreme caution when handling, testing and adjusting.

When working with solvents, observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet by the solvent vendor, especially when toxic or hazardous solvents are used.

Safety Symbols

Table 27 Safety Symbols

Symbol	Description
	The apparatus is marked with this symbol when the user should refer to the instruction manual in order to protect risk of harm to the operator and to protect the apparatus against damage.
	Indicates dangerous voltages.
	Indicates a protected ground terminal.
	Indicates eye damage may result from directly viewing the light produced by the deuterium lamp used in this product.
	The apparatus is marked with this symbol when hot surfaces are available and the user should not touch it when heated up.

WARNING

A WARNING

alerts you to situations that could cause physical injury or death.

➔ Do not proceed beyond a warning until you have fully understood and met the indicated conditions.

CAUTION

A CAUTION

alerts you to situations that could cause loss of data, or damage of equipment.

➔ Do not proceed beyond a caution until you have fully understood and met the indicated conditions.

Batteries Information

WARNING **Lithium batteries may not be disposed-off into the domestic waste. Transportation of discharged Lithium batteries through carriers regulated by IATA/ICAO, ADR, RID, IMDG is not allowed.**

Danger of explosion if battery is incorrectly replaced.

➔ Discharged Lithium batteries shall be disposed off locally according to national waste disposal regulations for batteries.

➔ Replace only with the same or equivalent type recommended by the equipment manufacturer.

WARNING **Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering.**

Udskiftning må kun ske med batteri af samme fabrikat og type.

➔ Lever det brugte batteri tilbage til leverandøren.

WARNING **Lithiumbatteri - Eksplosionsfare.**

Ved udskiftning benyttes kun batteri som anbefalt av apparatfabrikanten.

➔ Brukt batteri returneres appararleverandoren.

NOTE Bij dit apparaat zijn batterijen geleverd. Wanneer deze leeg zijn, moet u ze niet weggooien maar inleveren als KCA.

Radio Interference

Cables supplied by Agilent Technologies are screened to provide optimized protection against radio interference. All cables are in compliance with safety or EMC regulations.

Test and Measurement

If test and measurement equipment is operated with unscreened cables, or used for measurements on open set-ups, the user has to assure that under operating conditions the radio interference limits are still met within the premises.

Sound Emission

Manufacturer's Declaration

This statement is provided to comply with the requirements of the German Sound Emission Directive of 18 January 1991.

This product has a sound pressure emission (at the operator position) < 70 dB.

- Sound Pressure Lp < 70 dB (A)
- At Operator Position
- Normal Operation
- According to ISO 7779:1988/EN 27779/1991 (Type Test)

UV-Radiation

Emissions of ultraviolet radiation (200-315 nm) from this product is limited such that radiant exposure incident upon the unprotected skin or eye of operator or service personnel is limited to the following TLVs (Threshold Limit Values) according to the American Conference of Governmental Industrial Hygienists:

Table 28 UV-Radiation Limits

Exposure/day	Effective Irradiance
8 hours	0.1 µW/cm^2
10 minutes	5.0 µW/cm^2

Typically the radiation values are much smaller than these limits:

Table 29 UV-Radiation Typical Values

Position	Effective Irradiance
Lamp installed, 50-cm distance	average 0.016 µW/cm^2
Lamp installed, 50-cm distance	maximum 0.14 µW/cm^2

Solvent Information

Observe the following recommendations on the use of solvents.

Flow Cell

Avoid the use of alkaline solutions (pH > 9.5) which can attack quartz and thus impair the optical properties of the flow cell.

Prevent any crystallization of buffer solutions. This will lead into a blokkage/damage of the flow cell.

If the flow cell is transported while temperatures are below 5 degree C, it must be assured that the cell is filled with alcohol.

Aqueous solvents in the flow cell can built up algae. Therefore do not leave aqueous solvents sitting in the flow cell. Add small % of organic solvents (e.g. Acetonitrile or Methanol ~5%).

Solvents

Brown glass ware can avoid growth of algae.

Always filter solvents, small particles can permanently block the capillaries. Avoid the use of the following steel-corrosive solvents:

- Solutions of alkali halides and their respective acids (for example, lithium iodide, potassium chloride, and so on).
- High concentrations of inorganic acids like nitric acid, sulfuric acid especially at higher temperatures (replace, if your chromatography method allows, by phosphoric acid or phosphate buffer which are less corrosive against stainless steel).
- Halogenated solvents or mixtures which form radicals and/or acids, for example:

  $2CHCl_3 + O_2 \rightarrow 2COCl_2 + 2HCl$

  This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol.

- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, di-isopropylether) such ethers should be filtered through dry aluminium oxide which adsorbs the peroxides.
- Solutions of organic acids (acetic acid, formic acid, and so on) in organic solvents. For example, a 1-% solution of acetic acid in methanol will attack steel.
- Solutions containing strong complexing agents (for example, EDTA, ethylene diamine tetra-acetic acid).
- Mixtures of carbon tetrachloride with 2-propanol or THF.

Declaration of Conformity for HOX2 Filter

Declaration of Conformity

We herewith inform you that the

Holmium Oxide Glass Filter

used in Agilents absorbance detectors listed in the table below meets the requirements of National Institute of Standards and Technology (NIST) to be applied as certified wavelength standard.

According to the publication of NIST in J. Res. Natl. Inst. Stand. Technol. 112, 303-306 (2007) the holmium oxide glass filters are inherently stable with respect to the wavelength scale and need no recertification. The expanded uncertainty of the certified wavelength values is 0.2 nm.

Agilent Technologies guarantees, as required by NIST, that the material of the filters is holmium oxide glass representing the inherently existent holmium oxide absorption bands.

Test wavelengths:

Product Number	Series	Measured Wavelength *	Wavelength Accuracy	Optical Bandwidth
79883A	1090	361.0 nm 418.9 nm 453.7 nm 536.7 nm	+/- 1 nm	2 nm
79854A	1050			
G1306A	1050			
G1315A, G1365A	1100			
G1315B/C, G1365B/C	1100 / 1200 / 1260			
G1600A, G7100A	CE			
79853C	1050	360.8nm 418.5nm 536.4nm	+/- 2 nm	6 nm
G1314A/B/C G1314D/E/F	1100 / 1200 / 1260	360.8nm 418.5nm 536.4nm	+/- 1 nm	6 nm
G4286,..., 90A/B/C	1120 / 1220			

*) The variation in Measured Wavelength depends on the different Optical Bandwidth.

May 19, 2010

(Date)

Thomas Joir

(R&D Manager)

G. Gable

(Quality Manager)

P/N 89550-90501	Revision: H Effective by: May 19, 2010	Agilent Technologies

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In This Book

This manual covers the Agilent 1260 Infinity Variable Wavelength Detector (G1314B/C)

The manual describes the following:

- introcduction and specifications,
- installation,
- using and optimizing,
- troubleshooting and diagnose,
- maintenance,
- parts identification,
- hardware information,
- safety and related information.

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